



SMITHSONIAN INSTITUTION
U. S. NATIONAL MUSEUM

Vol. 93

Washington: 1943

No. 3157

THE NEARCTIC¹ SPECIES OF PARASITIC FLIES BELONGING TO *ZENILLIA* AND ALLIED GENERA

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THIS paper is a revision of the known species of parasitic two-winged flies belonging to the genera *Zenillia*, *Phryxæ*, *Carcelia*, *Aplomya*, *Sisyropa*, *Thelymyia*, and a new genus (p. 107) (Diptera: Larvaevoridae). It includes also some Palearctic species of the genera *Zenillia*, *Phryxæ*, *Carcelia*, and *Aplomya* and some Neotropical species of the genera *Zenillia*, *Carcelia*, and a second new genus (p. 106).

In 1897 Coquillett² placed the species belonging to this group of genera in *Exorista* Meigen, 1803. However, Coquillett³ pointed out in 1910 that *Exorista* is monobasic, with *Musca larvarum* Linnaeus as the type, a species that is not congeneric with those referred to *Exorista* by Coquillett in 1897 and subsequently by other authors. In 1924 Aldrich and Webber⁴ selected *Zenillia* Robineau-Desvoidy, 1830, to replace *Exorista* of authors, not Meigen. More recently Townsend⁵ has expressed the opinion that the treatment proposed by Aldrich and Webber combines several widely distinct elements under one generic name. By contrast Townsend has recognized 17 different generic segregates in this complex. It does, nevertheless, seem advisable to divide the species groups into several distinguishable units and to ac-

¹ Some Palearctic and Neotropical species are also included.

² Revision of the Tachinidae of America North of Mexico, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, 1897.

³ The type-species of the North American genera of Diptera. Proc. U. S. Nat. Mus., vol. 37, pp. 499-647, 1910.

⁴ The North American species of parasitic two-winged flies belonging to the genus *Phorocera* and allied genera. Proc. U. S. Nat. Mus., vol. 63, art. 17, 90 pp., 1924.

⁵ Townsend, Manual of myiology, pt. 4, p. 212, 1936.

cord these generic rank. In this revision 6 of the 22 previously created generic names that have been employed for components of the complex treated by Aldrich and Webber under *Zenillia* are retained as valid, and 2 new generic names are proposed.

This group of genera may be characterized as follows: Eyes pilose; ocellar bristles directed forward; frontal bristles descending more or less down on parafacials, at least to base of third antennal segment, one to three uppermost bristles usually reclinate (preverticals); parafrontals pollinose; vibrissae situated at most slightly above oral margin, vibrissal or facial ridges usually bristly on lowest one-third, sometimes extending approximately halfway or slightly more; parafacials bare, at least on lower half; antennae elongate, reaching at least three-fourths way to oral margin, second antennal segment less than half as long as third segment, third antennal segment more than twice as long as wide; arista longer than third antennal segment and not thickened to near the apex, face receding, proboscis well developed and not elongate; palpi of normal length and shape. Chaetotaxy of thorax well developed; anterior acrostichals distinct, one pair just in front of the suture; pteropleural bristle of normal length or weak; posterior sublateral bristle present; middle of propleura hairless.⁶ Wings of normal venation; apical cell open, rarely closed in margin, ending more or less before apex of wing; bristles present only at base of third vein, otherwise the veins bare; posterior cross-vein never more noticeably oblique than apical cross-vein; fourth vein without a distinct fold; last section or fifth vein never half as long as preceding section. Thoracic squamae not hairy; infrasquamal setulae lacking. Abdomen usually black or gray, never metallic blue or green; wider than deep at base; bristly in appearance with at least marginal macrochaetae. Anterior tibiae usually with one or two median posterolateral bristles.

KEY TO THE GENERA

1. Eye high, occupying nearly whole side of head; gena small or nearly linear, not over one-twelfth the eye height (exclusive characteristics).⁷ Usually with only two sternopleural macrochaetae, sometimes three. (Hind tibia ciliate on the anterolateral⁸ side, at least in the male, with regular comblike curved bristles, among which one or two sometimes stand out larger)-----3. *Carcelia* (p. 37)
- Eye not high or occupying whole side of head; gena larger, at least one-eighth or more the eye height; usually more than two sternopleural macrochaetae----- 2

⁶ *Aptomya submissa* (Aldrich and Webber) is an exception.

⁷ The term "exclusive characteristics" is used to indicate that the designated part of the key will serve to separate the particular genus or genera from the rest of the genera in the key.

⁸ Anterolateral is the name used for the anterodorsal or outer front side of the tibia; posterolateral, for outer back side of the tibia.

2. Abdomen in both sexes wide and deep, almost globose; fourth segment, unless contracted in drying, closing in a slit above genital opening (exclusive characteristics)----- 1. *Zenillia* (p. 4)
 Abdomen of ordinary form----- 3
3. Front at vertex or narrowest part less than one-third width of head, rarely exceeding 30 percent of head width; front narrower in male than in female, with somewhat diverging margins; claws and pulvilli in male elongated----- 4
 Front at vertex or narrowest part more than one-third width of head, often two-fifths of head width; front more or less protruding, of equal breadth in both sexes, with almost parallel or little diverging margins; claws and pulvilli small in both sexes (exclusive characteristics)----- 6
4. Scutellum with three pairs of marginal scutellars and an apical pair; hind tibia usually with unequal bristles, sometimes weakly ciliate in certain species----- 5
 Scutellum with four pairs of marginal scutellars and one strong decussate apical pair (exclusive characteristic). Hind tibia strongly ciliate on anterolateral side in both sexes; with regular, long, comblike, curved bristles, among which one sometimes stands out larger. (Third abdominal segment of male with dense patch of hairs underneath on each side.)----- 5. *Sisyropa* (p. 97)
5. Sternopleural macrochaetae two; antenna with first two segments and basal part of third yellow; frontal bristles descending to middle of second antennal segment; fourth segment of abdomen destitute of macrochaetae; thorax and abdomen wholly golden-pollinose
 8. *Angustia*, new genus (p. 107)
 Sternopleural macrochaetae three or four; antenna usually black, at most first and second segments rufous; frontal bristles descending at least to base of third antennal segment; fourth segment usually with either discal or marginal macrochaetae; species predominantly with thorax and abdomen black, gray-pollinose----- 4. *Aplomya* (p. 70)
6. Apical scutellars erect or proclinate, decussate; four postsutural dorsocentral macrochaetae. Male without fronto-orbital bristles----- 7
 Apical scutellars curved backward, decussate; three postsutural dorsocentral macrochaetae; palpi yellow. Male with two fronto-orbital bristles
 6. *Thelymyia* (p. 103)
7. Species predominantly gray-pollinose; palpi black----- 2. *Phryxe* (p. 31)
 Species predominantly golden-pollinose; palpi yellow
 7. *Chrysophryxe*, new genus (p. 106)

All the forms treated in this key will run to *Zenillia* in Curran's key to the genera of Tachinidae.⁹

This key will eliminate the past practice that made it necessary to cross reference some of the species in certain genera. The use of sexual characters has been restricted. The primary characters cited will place all individuals in their proper genus. Secondary sexual characters have been used only as a supplementary assistance.

⁹ Curran, C. H., The families and genera of North American Diptera, 512 pp., illus., 1934.

1. Genus ZENILLIA Robineau-Desvoidy

- Zenillia* ROBINEAU-DESVOIDY, Mém. Acad. Sci. Inst. France, vol. 2, p. 152, 1830; Histoire naturelle des diptères des environs de Paris, vol. 1, p. 471, 1863.—BEZZI and STEIN, Katalog der palaarktischen Dipteren, vol. 3, p. 277, 1907.—COQUILLET, Proc. U. S. Nat. Mus., vol. 37, p. 621, 1910.—BAER, Zeitschr. Angew. Ent., vol. 7, p. 118, 1921.—ALDRICH and WEBBER (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 7, 1924.—LUNDBECK, Diptera Danica, pt. 7, p. 337, 1927.—TOWNSEND, Manual of myiology, pt. 4, p. 231, 1936. (Genotype, *Musca libatrix* Panzer. By designation of Robineau-Desvoidy, 1836.)
- Myxexorista* BRAUER and BERGENSTAMM, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 58, p. 331, 1891; Verh. zool.-bot. Ges. Wien, vol. 43, p. 479, 1893.—TOWNSEND, Manual of myiology, pt. 4, p. 278, 1936. (Genotype, *Musca libatrix* Panzer. By designation of Brauer and Bergenstamm.)
- Hyphanthropaga* TOWNSEND, Psyche, vol. 6, p. 247, 1892; Manual of myiology, pt. 4, p. 249, 1936.—COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 91, 1897. (Genotype, *Meigenia hyphanthrae* Townsend. By original designation.) (New synonymy.)
- Exorista* OF AUTHORS (nec. Meigen).—COQUILLET, (partim), U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 91, 1897.—STEIN (partim), Arch. Naturg., Abt. A, Heft. 6, p. 67, 1924.—BARANOFF (partim), Institut Hygiene und Schule Volksgesundheit, Zagreb, Arb. parasit. Abt., No. 3, 1931.
- Eusisyropa* TOWNSEND, Smithsonian Misc. Coll., vol. 51, No. 2, p. 97, 1908; Manual of myiology, pt. 4, p. 245, 1936. (Genotype, *Exorista blanda* Osten Sacken. By original designation.)
- Euxorista* TOWNSEND, Proc. Ent. Soc. Washington, vol. 14, p. 166, 1912; Manual of myiology, pt. 4, p. 249, 1936. (Genotype, *Exorista futilis* Osten Sacken. By original designation.)
- Chrysoasicera* TOWNSEND, Journ. N. Y. Ent. Soc., vol. 23, p. 230, 1915; Manual of myiology, pt. 4, p. 112, 1936. (Genotype, *C. borealis* Townsend. By original designation.)
- Chrysoexorista* TOWNSEND, Proc. U. S. Nat. Mus., vol. 49, p. 435, 1915; Manual of myiology, pt. 4, p. 94, 1936. (Genotype, *C. viridis* Townsend. By original designation.)

There exists a difference of opinion concerning the generic limits of *Zenillia*. Stein and Baranoff consider *Zenillia* to be a synonym of *Exorista* of authors. Baer and Lundbeck separate *Zenillia* from *Exorista* of authors, but they are not sure of the limits of these two genera. The only apparent difference between Baer and Lundbeck's *Zenillia* and *Exorista* is that in *Zenillia* the facial ridges are usually considered to have regularly arranged bristles of somewhat equal length above the vibrissae that ascend to near or fully to the middle, whereas in *Exorista* the facial ridges have only a few rapidly decreasing bristles above the vibrissae. The separation of these two genera on the presence or absence of bristles on the facial ridges cannot be attempted with any degree of assurance. The writer is of the opinion that the character is of specific rather than of generic value. As defined in this paper, the majority of the species that Baer and Lundbeck place in *Zenillia* of authors can be referred to *Zenillia* Robineau-Desvoidy, and the majority of species they place in *Exorista*

of authors can be referred to *Aplomya* Robineau-Desvoidy. Townsend has described five genera which cover part of the material that is placed in *Zenillia* in this revision. Townsend places *Zenillia* in the tribe Phrynoini; *Hyphantrophaga*, *Eusisyropa*, and *Euexorista* in the tribe Trypherini; *Chrysomasiccera* in the tribe Phoroceratini; and *Chrysocxorista* in the tribe Compsilurini.

Eusisyropa of Aldrich and Webber (nec Townsend) approaches more closely to generic concepts than any of the other proposed subgenera in their *Zenillia* complex. While omitting some of the *Eusisyropa* congeners, they have included species that Townsend referred to the genera *Hyphantrophaga*, *Eusisyropa*, and *Euexorista*.

The characters used to designate the genus *Zenillia* in this paper are as follows: Abdomen in both sexes wide and deep, almost globose; fourth segment, unless contracted in drying, closing in a slit above the genital opening. *Zenillia* can be separated without difficulty from *Phryxæ*, *Carcelia*, *Sisyropa*, *Thelymyia*, and *Chrysophryxæ*. A little practice should enable one to differentiate between *Zenillia* and *Aplomya*, but in all cases caution is advised so that mistakes may be avoided. Very few of the Nearctic species of *Zenillia* are bristly on the facial ridges above the lowest one-third.

The following grouping of the species treated in *Zenillia* is suggested for those workers who prefer or insist on restricted genera or a definition of species groups:

1. *libatrix* (*Zenillia*).
2. *futilis* (*Euexorista*).
3. *angustata*.
4. *hyphantriæ*, *euchaetiae*, *desmiae* (*Hyphantrophaga*).
5. *virilis*.
6. *blandita*.
7. *blanda*, *boarmiae*, *tucumanensis*, *autographæ* (*Eusisyropa*).
8. *viridis*, *lineata*, *marginata*, *taglinoi*, *facialis*, *dawsoni* (*Chrysocxorista*).
9. *ochracea*, *angustifrons*, *fulgoris* (*Chrysomasiccera*).

Additional specimens may enable us further to restrict group 8. As no useful taxonomic or bionomic result can be achieved at this time by placing these species groups in restricted genera, the genus *Zenillia* is retained as proposed.

The oviposition habits of some of the *Zenillia* congeners should be mentioned to show a biological relationship in the genus. The Palearctic species *libatrix*, *porcula*, and *pullata*, and the Nearctic species *futilis* and *blanda*, including in all probability the species of the *Eusisyropa* group, belong to Pantel's group 2, characterized by small microtype eggs deposited on plant tissue, where they are consumed by the host along with the tissue. As this type of oviposition is associated with the typical shape of the abdomen cited, our future

knowledge will probably place many of our other species of *Zenillia* in Pantel's group 2.

Most of the species of *Zenillia* possess an inner ventral bristle on the midtibia. It will be noticed that this character, as used in the following key, while usually of specific value, is only a secondary sexual character in some species. The *Hyphantrophaga* and *Eusisyropa* groups have one bristly hair behind on the apex of the hind coxa. *Zenillia fulgoris* has one very fine and *Zenillia virilis* has several fine hairs on the apex of the hind coxa. All the other species of *Zenillia* lack these bristly hairs on the hind coxa.

KEY TO THE SPECIES OF ZENILLIA

There are 21 species of *Zenillia* included in the key. Nine occur in the Nearctic Region, 8 in the Neotropical, and 4 are common to both realms; the genotype *libatrix* is a Palearctic species. Eight of the species are new, and 4 have been removed from synonymy. Since *Zenillia libatrix* has been released in the northeastern part of the United States, it is included in the key, but to date there is no evidence to indicate that the species has become established. *Chrysophryæ tibialis*, new species, is included because the type is labeled as the male allotype of *Chrysoæorista viridis* Townsend (U.S.N.M. No. 19611), an included species.

1. Midtibia usually with one median anterolateral bristle; if with a smaller additional one, then facial ridge is never bristly on more than lowest one-fourth..... 3
Midtibia with two or more median anterolateral bristles..... 2
2. Midtibia with two median anterolateral bristles, upper one smaller; palpus yellow, facial ridge bristly to middle.....1. *libatrix* (Panzer) (p. 8)
Midtibia with three or more median anterolateral bristles; palpus black; parafacial with a dark-brown reflecting spot just below lowest frontal bristles.....2. *futilis* (Osten Sacken) (p. 11)
3. Discal macrochaetae present on second and third abdominal segments.... 6
Discal macrochaetae absent on second and third abdominal segments.... 4
4. Three postsutural dorsocentral macrochaetae; palpus rufous, black toward base, extreme tip yellow; midtibia with one strong median anterolateral bristle and a smaller one below (male only)
3. *angustata* (Van der Wulp) (p. 12)
Four postsutural dorsocentral macrochaetae: palpus yellow; midtibia usually with one median anterolateral bristle..... 5
5. Antenna with first and second segments rufous, third black; facial ridge bristly on lowest one-fifth; legs black, tibiae brownish black; abdomen with dorsum completely covered with gray pollen, which extends on to dorsal shoulders of first segment; dorsal vitta indicated at least on second segment.....4. *euchaetiae*, new species (p. 13)
Antenna with first and second segments and in female base of third segment yellow, remainder black; facial ridge bristly on more than lowest one-fifth, often nearly halfway; legs reddish brown; abdomen in male with narrow apical margins of segments 2, 3, and 4 brownish black, adjacent pollen

- with a brownish or tawny tinge; marginal pair of macrochaetae on first segment weak----- 5. *hyphantriae* (Townsend) (p. 15)
- Antenna with first and second segments and in female base of third segment yellow, remainder black; facial ridge bristly on more than lowest one-fifth, often nearly halfway; legs black, tibiae brownish (contrasting); abdomen with dorsum of first segment black; segments 2, 3, and 4 completely covered with gray pollen; wing veins dark brown, almost black; marginal pair of macrochaetae on first segment weak---- 6. *desmiae*, new species (p. 16)
6. Normally with three sternopleural macrochaetae¹⁰----- 7
- Normally with two sternopleural macrochaetae and three postsutural dorsocentral macrochaetae¹⁰; females with outer vertical bristle well developed; middle tibia lacking an inner ventral bristle; second segment of antenna black; black, gray-pollinose species; apical scutellars normally turned backward; male abdomen with third and fourth segments shining brown or black on venter, contrasting with pollinose second; inner forceps slender apically, almost straight, ending inwardly at apex with a small tooth, hairy about two-thirds of its entire length-- 7. *virilis* Aldrich and Webber (p. 17)
7. Head, thorax, and abdomen predominantly golden or yellow-pollinose----- 12
- Head, thorax, and abdomen predominantly black, gray-pollinose----- 8
8. Two sternopleural macrochaetae and a sternopleural bristle (rarely indistinguishable from surrounding sternopleural hairs) and four postsutural dorsocentral macrochaetae; apical scutellars normally turned upward. Male abdomen with third and fourth segments pollinose on venter; inner forceps rather thick apically, outwardly with long hair to last fifth, which is bent at an obtuse angle (last fifth in *autographae*, new species, is straight). Male without and female with an inner ventral bristle on midtibia. Female with outer vertical bristle so poorly developed as to appear to be lacking----- 9
- Three strong sternopleural macrochaetae and four postsutural dorsocentral macrochaetae; strong apical scutellars turned backward. Male and female with an inner ventral bristle on midtibia. Female with well-developed outer vertical bristle----- 8. *blandita* (Coquillett) (p. 18)
9. Legs with femur reddish yellow or yellow; second antennal joint red or yellow----- 11
- Legs with femur black and tibia blackish; second antennal joint black or at most obscurely rufous----- 10
10. Frontal orbit silvery white with a faint brassy tinge; abdominal segments gray-pollinose, sometimes lightly tinged with yellow or brown, fourth segment more so but not in striking contrast to intermediate segments
9. *blanda* (Osten Sacken) (p. 19)
- Frontal orbit golden; fourth abdominal segment golden-pollinose in striking contrast to gray of other segments.
10. *tucumanensis*, new species (p. 21)
11. Tarsi and sides of thorax reddish, blending somewhat with yellow color of legs and antennae----- 11. *boarmiae* (Coquillett) (p. 21)
- Tarsi and sides of thorax blacker, yellow of legs and antennae making a sharp contrast----- 12. *autographae*, new species (p. 23)
12. Four postsutural dorsocentral macrochaetae----- 16
- Three postsutural dorsocentral macrochaetae----- 13

¹⁰The numbers of dorsocentral and sternopleural macrochaetae are known to vary within certain limits in *virilis* and *blanda*; likewise the midtibial, inner ventral bristle in *blanda*.

Exorista libatrix (Panzer) MEIGEN, Systematische Beschreibung der europäischen zweiflügeligen Insecten, vol. 7, pp. 46, 256, 1838.—STEIN, Arch. Naturg., Abt. A, Heft 6, pp. 77-78, 1924.—BARANOFF, Institut für Hygiene und Schule für Volksgesundheit, Zagreb, Arb. parasit. Abt., No. 3, p. 8, 1931.

Myxexorista libatrix (Panzer) BRAUER and BERGENSTAMM, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 58, p. 333, 1891.

Head with front of male at narrowest 0.25 to 0.27 (in three specimens) and in female 0.29 to 0.31 (in three specimens) of head width; frontal row of seven to eight bristles in male and five to seven in female, extending from on a level with base of third antennal segment to two reclinate preverticals; male with very weak and female with outer vertical bristle; gena one-fifth to one-fourth eye height, silver gray; frontal orbit golden, face silver, and posterior orbit golden on upper portions and silver on lower portions; antenna black, third segment in male more than three times and in female two and three-fourths times second; arista thickened on basal two-fifths, penultimate segment at least as long as broad; palpus yellow, infuscated at base.

Thorax heavy golden-pollinose on dorsal portions, sides more grayish; four mesonotal vittae; four postsutural dorsocentral macrochaetae; scutellum heavy golden-pollinose with three pairs of marginal scutellars and one decussate apical pair turned backward, one pair of discal scutellars; three sternopleural macrochaetae; legs black, a little grayish pruinose; front tibia with two median posterolateral bristles; midtibia with one inner ventral bristle; hind tibia not ciliate; wing tinged with yellow at base and anterior margin; third vein with two or three bristles at base; squamula yellow.

Abdomen completely covered dorsally with heavy golden pollen gradually becoming gray on venter, especially on intermediate segments; dorsal vitta lacking in some lights, obscurely marked in others; first and second segments with a pair and third segment with a row of marginal macrochaetae; second and third segments with a pair of discal macrochaetae often more or less roughly arranged, often with additional bristles and macrochaetae in discal area; fourth segment more or less irregularly covered with bristles, in some specimens discal bristles a little larger and roughly arranged in a row.

Length 6.5 to 8 mm.

Distribution.—The species is widely distributed throughout Europe from England in the west to Russia in the east and from Spain in the south to Finland in the north.

Hosts.—*Porthetria dispar* (Linnaeus), *Stilpnotia salicis* (Linnaeus), *Nygmia phaeorrhoea* (Donovan), *Calocasia coryli* (Linnaeus), *Thaumetopoea processionea* (Linnaeus), *Oxycesta geographica* (Fabricius), and *Pygaera pigra* (Hufnagel). Specimens examined from these hosts were reared at the Central European station formerly maintained at Budapest, Hungary, by the Division of Forest Insect Investiga-

tions, U. S. Bureau of Entomology and Plant Quarantine. Published records: *Abrostola asclepiadis* (Schifferrmüller) (Bezzi and Stein, Howard and Fiske, Baer, Lundbeck), *Acrionicta auricoma* (Fabricius) (Lundbeck), *Brephos nothum* (Hübner) (Bezzi and Stein, Howard and Fiske, Baer, Lundbeck), *Bupalus piniarius* (Linnaeus) (Baer, Eidmann, Lundbeck), *Dasychira pudibunda* (Linnaeus) (Bezzi and Stein, Howard and Fiske, Baer, Lundbeck), *Drepana cultraria* (Fabricius) (Wainwright), *Nygmia phaeorrhaea* (Donovan) (= *Eurproctis chrysoorrhoea* [auct. not (Linnaeus)]) (Baer, Lundbeck, Dowden), *Larentia autumnalis* (Ström) (Bezzi and Stein, Howard and Fiske, Baer, Lundbeck), *Liparis monacha* (Linnaeus) (Baer), *Loxostege sticticalis* (Linnaeus) (Mamonov), *Porthetria dispar* (Linnaeus) (Bezzi and Stein, Howard and Fiske, Baer, Lundbeck, Dowden), *Malacosoma neustria* (Linnaeus) (Bezzi and Stein, Howard and Fiske, Baer, Lundbeck), *Oxycesta geographica* (Fabricius) (Dowden), *Phlyctaenodes verticalis* (Linnaeus) (Baer, Lundbeck), *Porthesia similis* (Fuessly) (Baer, Lundbeck), *Pygaera anachoreta* (Fabricius) (Baer, Lundbeck), *P. pigra* (Hufnagel) (Bezzi and Stein, Howard and Fiske, Baer, Lundbeck, Dowden), *Salebria marmorata* (Alphéraky) (Pustovoit), *Stilpnotia salicis* (Linnaeus) (Brown, Dowden), *Sylepta ruralis* (Scopoli) (Baer, Lundbeck), *Thaumetopoea processionea* (Linnaeus) (Bezzi and Stein, Howard and Fiske, Baer, Lundbeck), *Hyponomeuta cognatella* (Hübner) (Lundbeck), *H. evonymella* (Linnaeus) (Bezzi and Stein, Howard and Fiske, Baer, Lundbeck), *H. padella* (Linnaeus) (Bezzi and Stein, Howard and Fiske, Baer, Lundbeck), *H. rorella* (Hübner) (Baer, Lundbeck). Dowden records it on laboratory-attacked material at Budapest, Hungary, as hibernating in *Oxycesta geographica*, *Calocasia coryli*, and *Acrionicta rumicis* (Linnaeus); as reared on laboratory-attacked material at Melrose, Mass., on *Bombyx mori* (Linnaeus), *Euchaetias egle* (Drury), and *Melalopha inclusa* Hübner (Farquhar and Seeley), and hibernating in *M. inclusa* (Dowden).

Remarks.—The foregoing description is based on an examination of a considerable number of European reared specimens mostly from *Porthetria dispar*. Various European specialists comment on the species as varying in color, sometimes being quite grayish. Specimens examined that were reared from *Oxycesta geographica* and *Pygaera pigra* appeared to be a deeper, duller, golden-brown and more hairy or bristly. In the specimens from *O. geographica* there was a group of irregularly placed discal macrochaetae on the third segment.

Zenillia libatriæ has been liberated as a parasite of the gypsy moth in the northeastern part of the United States, but there is no evidence indicating that the species has become established.

Adults, May to September; number per host, one to several; generations, one, two, or more; hibernation, as larva in host pupa.

2. ZENILLIA FUTILIS (Osten Sacken)

Euxorista futilis OSTEN SACKEN, Can. Ent., vol. 19, p. 161, 1887.—WILLISTON, Scudder's Butterflies of Eastern United States and Canada, vol. 3, p. 1917, pl. 89, fig. 10, 1889.—COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 98, 1897.—SMITH, Catalogue of New Jersey insects, p. 780, 1909.—GIBSON, Ann. Rep. Ent. Soc. Ontario, 1912, p. 133.—TOTHILL, Can. Ent., vol. 45, p. 71, 1913.—GREENE, Proc. U. S. Nat. Mus., vol. 60, art. 10, p. 32, pl. 19, fig. 93 (puparium), 1922.

Euxorista futilis (Osten Sacken) TOWNSEND, Proc. Ent. Soc. Washington, vol. 14, p. 166, 1912; Manual of myiology, pt. 4, p. 249, 1936.

Zenillia futilis (Osten Sacken) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 42, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925; Proc. Boston Soc. Nat. Hist., vol. 38, p. 87, 1925.—ESSIG, Insects of western North America, p. 581, 1926.—LEARNED, Bull. Brooklyn Ent. Soc., vol. 22, p. 219, 1927.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.—ALDRICH, Proc. U. S. Nat. Mus., vol. 80, art. 20, p. 3, 1932.—SCHAFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 112, 1934.

Head with front of male at narrowest 0.29 to 0.30 (in five specimens) and of female 0.31 to 0.33 (in five specimens) of head width; frontal row of seven to nine bristles, rarely six in some females, extending from on a level with insertion of arista to two reclinate upper frontals (preverticals); facial ridge bristly on lowest one-fourth; gena one-sixth eye height; frontal orbit and parafacial golden or yellow-pollinose; antenna black, third segment in the male three and one-third and in the female two and two-thirds times second; arista thickened on basal one-fourth, penultimate segment short.

Thorax black, gray-pollinose marked with five mesonotal vittae; four postsutural dorsocentral macrochaetae; scutellum black with three pairs of marginal scutellars and one decussate apical pair turned backward, one pair of discal scutellars; three sternopleural macrochaetae; midtibia with three median anterolateral bristles, sometimes more in female, one inner ventral bristle; hind tibia more or less ciliate with two longer bristles.

Abdomen black, gray-pollinose, fourth segment golden; first and second segments with pair, third and fourth with a row of marginal macrochaetae; row of discal macrochaetae on fourth segment only; abdominal dorsal vitta obscurely marked.

Hypopygium black, gray-pollinose, inner and outer forceps of equal length; the inner curving slightly inward, shining black, and densely clothed with long fine hairs; the outer very slender and tapering to a fine point.

Length 6.5 to 11 mm.

*Distribution*¹¹.—Maine 3, New Hampshire 1, Vermont 2, Massachu-

¹¹ Under "Distribution" the numbers following the names of the States indicate the number of localities from which specimens have been examined. In the case of published records, they indicate the number of localities mentioned in addition to those from which specimens were examined. The use of the numbers enables one to visualize the centers of distribution as well as the fringes of the areas involved.

setts 18, Connecticut 2, New York 2, New Jersey 4, Indiana 1, Idaho 1, South Dakota 1, Wisconsin 1, Oregon 2, Washington 1. Published and unpublished records not duplicated above: Massachusetts 1 (Aldrich); Connecticut (Britton); New York 13 (West), 1 (Coquillett); New Jersey 2 (Smith), 1 (Weiss); Pennsylvania (Schaffner and Griswold); North Carolina (Brimley); Illinois (Coquillett); California (Coquillett, Essig); Quebec (Winn and Beaulieu); Ontario (Gibson, Tothill, and Winn and Beaulieu); British Columbia (Currie).

Type.—Museum of Comparative Zoology, Cambridge, Mass.

Hosts.¹²—*Vanessa atalanta* (Linnaeus) 303, *Ennomos subsignarius* (Hübner) 142, *Malacosoma americana* (Fabricius) 9, *Vanessa* spp. 7, *Malacosoma disstria* Hübner 2, *Euchaetias egle* (Drury) 2, *Nymphalis milberti* (Godart) 2, *Sarothripus revayanus* (Scopoli) 1, *Nephelodes emmedonia* (Cramer) 1, *Pyrausta nubilalis* (Hübner) 1, *Septis wamiformis* (Guénée) 1. Published records not duplicated in the above records: *Vanessa atalanta* (Linnaeus) (Harris and Scudder, Johnson), *Vanessa cardui* (Linnaeus) (Schaffner and Griswold), *Malacosoma disstria evosa* form *thoracica* Stretch (Koebele), *M. disstria* (Lintner), *M. americana* (Lin), *Isia isabella* (Abbott and Smith) (Tothill), *Autographa californica* (Speyer) (Essig), *Apantesis phalerata* (Harris) (Learned).

Remarks.—The foregoing description was based on an examination of the following material: 463 reared specimens bearing Gypsy Moth Laboratory note numbers; 1 male from the Riley collection reared from *Vanessa atalanta* (Sprague); 1 male reared from *Pyrausta nubilalis* (Craig); 1 male reared from *Septis apamiformis*, May 16, 1884; 1 male and 3 females reared from *V. atalanta*, Nos. 1181, 1181u, and 1181y (Dimmock); 5 specimens bearing note numbers as follows: 1 male and 1 female 414° (Koebele), 1 female 568° (Koebele), 1 female 1936 (August 13), 1 female 1936 (2) 2341 (September 17); 5 males and 8 females (Riley, Walton, Gabrielson, Aldrich, Furniss, and Fluke); and 55 additional miscellaneous collected specimens from the Gypsy Moth Laboratory.

Adults, May to September; number per host, one or two; generations two or more; hibernation, larva in host pupa. Townsend pointed out that *Zenillia futilis* lays microtype eggs on foliage, which are swallowed by its hosts.

3. ZENILLIA ANGUSTATA (Van der Wulp), new combination

Exorista angustata VAN DER WULP, Biologia Centrali-Americana, Diptera, vol. 2, p. 70, 1890.—COQUILLETT, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 99, 1897. *Zenillia coquilletti* ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 11, 18, 1924. (New synonymy.)

¹² Under "Hosts" the numbers following the names of the hosts indicate the number of specimens examined which were reared from that particular host.

Head with front of male 0.32 head width; frontal row of eight bristles, extending from on a level with base of third antennal segment to two reclinate preverticals; strong outer vertical bristle; facial ridge bristly on lowest one-fourth; gena one-fourth eye height; frontal orbit and face silvery pollinose; antenna black, third segment four times the length of second; arista thickened on the basal one-third, penultimate segment short.

Thorax black, gray-pollinose marked with four mesonotal vittae; scutellum black, gray-pollinose with three pairs of marginal scutellars and one nondecussate apical pair; three sternopleural macrochaetae; midtibia with one inner ventral bristle; hind tibia not ciliate.

Abdomen black, silvery gray-pollinose; first segment, second and third segments at apex, and fourth segment except at the sides shining black; first and second segments with a pair and third segment with an encircling row of marginal macrochaetae; fourth segment with irregular bristles mostly on apical half.

Length 10 mm.

Type locality.—Chilpancingo, Mexico.

Distribution.—Texas 1, Mexico 1.

Type.—Male, British Museum. Type of *coquilletti*, male, U.S.N.M. No. 25702.

Host.—Unknown.

Remarks.—The writer had the privilege of examining the type series of *Exorista angustata* in the British Museum. The description was based on an examination of the type of *angustata* and the type of *coquilletti*. The type of *angustata* had a pair of strong outer vertical bristles; the palpi were strongly infuscated at the base with the tip lighter.

4. ZENILLIA EUCHAETIAE, new species

Zenillia ceratoniae (Coquillett) ALDRICH and WEBBER (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 41, 1924.

Zenillia ccratoniae SCHAFFNER and GRISWOLD (nec Coquillett), U. S. Dept. Agr. Misc. Publ. 188, p. 111, 1934.

Male (type).—Head with front at narrowest 0.27 head width; frontal row of nine bristles, extending from on a level with base of third antennal segment to two reclinate preverticals; facial ridge bristly on the lowest one-fifth; gena one-sixth eye height; parafrontal and face silvery white-pollinose; antenna with first and second segments rufous, third black, third segment four and one-half times length of second; arista thickened on basal one-fourth, penultimate segment short.

Thorax black covered with heavy gray pollen marked with four mesonotal vittae; scutellum black heavily covered with gray pollen, with three pairs of marginal scutellars and one small decussate apical

pair turned up, one pair of discal scutellars: three sternopleural macrochaetae; legs black with tibiae brownish black; midtibia with one median anterolateral bristle and one very small one above it; hind tibia subciliate; wing grayish hyaline, third vein with two to three bristles at the base.

Abdomen black, dorsum of all segments including the first completely covered with heavy gray pollen; indication of dorsal vitta on second and third segments; abdominal hairs depressed; first and second segments with a pair, and third with a row of marginal macrochaetae; fourth segment with a row of discal macrochaetae, tipped with marginal bristles.

Length 9 mm.

Female (allotype).—Front at narrowest 0.30 head width; six frontal bristles; third segment of antenna four times second; two fronto-orbital bristles. Midtibia with one median anterolateral bristle and a smaller one above; pulvilli small. Abdomen heavily covered with gray pollen; dorsal vitta indicated on second segment only; fourth segment with a row of discal and marginal macrochaetae. Otherwise the description is the same as for the male.

Length 9 mm.

Other specimens vary as follows: Front of male 0.28 to 0.29 and of female 0.30 to 0.32; 7 to 10 frontal bristles in male and 5 to 6 in female; third segment of antenna in female three and one-half times second. Mid tibia usually but not always with 1 small bristle above the 1 strong median anterolateral bristle. Dorsal vitta obscurely marked.

Length 7 to 9 mm.

Type locality.—Clayton, N. Y.

Distribution.—Massachusetts 4, New York 2, New Jersey 4, Pennsylvania 1, Maryland 1.

Type.—Male, U.S.N.M. No. 54174.

Hosts.—*Euchaetias egle* (Drury) 37, *Cyenia tenera* (Hübner) 42, *Pyrausta jutitialis* (Lederer) 11, *Cyenia inopinata* (Henry Edwards) 2.

Remarks.—The material examined consisted of reared specimens bearing Gypsy Moth Laboratory note numbers as follows: Type and one female paratype reared from *Euchaetias egle*, No. 12130L10; one male paratype reared from *E. egle*, Adams, N. Y., No. 12130M7; one female paratype reared from *E. egle*, North Branch, N. J., No. 11741M9; allotype, three male paratypes, and one female paratype reared from *Cyenia tenera*, Somerville, N. J., No. 11779H3; one female paratype reared from *C. tenera*, Somerville, N. J., No. 11779H2; 82 additional reared specimens; and one male, Pinnners Island, Md. (Shannon).

Adults, June to September; number per host, one, sometimes two; generations, one or two; hibernation, in host pupa.

5. *ZENILLIA HYPHANTRIAE* (Townsend), new combination

Meigenia hyphantriae TOWNSEND, Psyche, vol. 6, p. 176, 1891.

Hyphantrophaga hyphantriae (Townsend) TOWNSEND, Psyche, vol. 6, pp. 247-248, 1892; Manual of myiology, pt. 4, p. 249, 1936.—GILLETTE, Trans. Amer. Ent. Soc., vol. 22, p. 75, 1895.—BAKER, Ent. News, vol. 6, p. 174, 1895.—COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, pp. 17, 91, 1897; Proc. U. S. Nat. Mus., vol. 37, p. 554, 1910.—GREENE, Proc. U. S. Nat. Mus. vol. 60, art. 10, p. 17, pl. 6, fig. 26 (puparium), 1922.—ESSIG, Insects of Western North America, p. 580, 1926.

Exorista ceratoniae COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, pp. 13, 101, 1897.—REINHARD, Ent. News, vol. 32, p. 72, 1921.—LUGINBILL, U. S. Dept. Agr. Tech. Bull. 34, p. 81, 1928. (New synonymy.)

Zenillia ceratoniae (Coquillett) ALDRICH and WEBBER (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 41, 1924.

Didyma exigua LEIBY (nec Van der Wulp) North Carolina Dept. Agr. Bull., Feb. 1925, p. 18.

Head with front of male at narrowest 0.27 to 0.30 and of female 0.32 to 0.33 of head width; frontal row of six to eight bristles in male and six to seven in female, extending from on a level with base of third antennal segment to two reclinate preverticals; facial ridge bristly on lowest one-third to two-fifths; gena one-sixth eye height; parafrontal and face silvery white pollinose; antenna with third segment in male four and in female three and one-half times length of second; arista thickened on basal one-fourth, penultimate segment short.

Thorax black, gray-pollinose marked with four mesonotal vittae; scutellum black, heavily covered with gray pollen, with three pairs of marginal scutellars and one very small decussate apical pair turned up, one pair of discal scutellars; three sternopleural macrochaetae; legs reddish brown; midtibia with one median anterolateral bristle, one inner ventral bristle; hind tibia subciliate; wing grayish hyaline, third vein with two to three bristles at the base.

Abdomen black, heavily covered with gray pollen, last three segments wholly gray-pollinose in female; first segment with a weak or vestigial pair, second with a pair, and third with a row of marginal macrochaetae; fourth segment with a row of discal macrochaetae, tipped with marginal macrochaetae in female and marginal bristles in male.

Length 5.5 to 8 mm.

Type locality.—Las Cruces, N. Mex.

Distribution.—New Mexico 1, Texas 5, Oklahoma 1, Missouri 2, Kansas 1, Florida 1. Published and unpublished records not duplicated above: North Carolina (Leiby), Tennessee (Luginbill), Mis-

souri (Coquillett), Texas (Reinhard), Colorado (Baker, Aldrich, and Webber), Arizona (Coquillett).

Type.—Female, U.S.N.M. No. 889. *Exorista ceratomiæ* Coquillett, male, U.S.N.M. No. 3601.

Hosts.—*Hyphantria cunea* (Drury) 1, *Pempelia* sp. 2, *Omphalocera cariosa* Lederer 1, *Loxostege similalis* (Guénée) 2, *Lagoa crispata* Packard, *Laphygma frugiperda* (Abbott and Smith) 1, *Lygris diversilineata* Hübner 1, pyralid 1. Published records not duplicated above: *Loxostege similalis* (Reinhard), *Laphygma frugiperda* (Luginbill), *Eucaterpa variaria* Grote (Townsend), *Nymphalis milberti* (Godart) (Baker, Gillette), *Ceratomiæ undulosa* (Walker) (Riley), *Gloveria howardi* (Dyar) (Coquillett), *Aerobasis caryac* Grote (Leiby).

Remarks.—The foregoing description was based on an examination of the following material: Type female reared from *H. cunea*, September 1; type and one male paratype of *Exorista ceratomiæ* reared from *Pempelia* sp., Fort Worth, Tex., 4357° (Allison); one male paratype reared from *Omphalocera cariosa*, Oswego, Kans., July 2, 1892, 454L° (Newlon); one female paratype reared from pyralid, Cadet, Mo., September, 1890, 4730° (Barlow); one male reared from *Loxostege similalis*, Victoria, Tex. (Quaintance); one male reared from *L. similalis*, Waurika, Okla. (Kelly); one female reared from *Lagoa crispata*, McMecklin, Fla., February 25, 1889, 432°; one male reared from *Lygris diversilineata*, Chillicothe, Tex., September 24, 1909, Webster No. 6015 (Greene's type drawing); collected specimens consisting of seven males and four females (Reinhard, Townsend, and Tucker).

6. ZENILLIA DESMIAE, new species

This species resembles *Zenillia hyphantriae* (Townsend) in most respects.

Male (type).—Front 0.28 head width; frontal row of seven or eight bristles; facial ridge bristly on the lowest two-fifths; third segment or antenna five times length of second; arista thickened on basal one-sixth.

Legs black with tibiae brownish (contrasting); midtibia with one median anterolateral bristle; veins of wing dark brown, almost black.

Abdomen black heavily covered with gray pollen; dorsum of first segment shining black, not pollinose; the other three segments completely pollinose; first segment with a weak or vestigial pair of macrochaetae. Otherwise the description is much the same as for *Zenillia hyphantriae*.

Length 7 mm.

Female (allotype).—Front 0.31; six and nine frontal bristles; third segment of antenna three times second; facial ridge bristly on the lowest one-third. Midtibia with one small bristle above the one strong median anterolateral bristle. Pollen of the abdomen with a tawny tinge.

The two male paratypes differ but slightly from the type; front 0.26 and 0.27; frontal bristles seven to nine in number; in one, facial ridge bristly only one-third; third segment of antenna four and one-half times the second.

Length 7 mm.

Type locality.—Exeter, Calif.

Type.—Male, U.S.N.M. No. 54133.

Host.—*Desmia funeralis* Hübner 4.

Remarks.—Material examined consisted of four specimens reared from *Desmia funeralis* pupa; type and one male paratype, October 4, 1936; allotype and one male paratype, October 23, 1936.

7. ZENILLIA VIRILIS Aldrich and Webber

Exorista blanda of Coquillett (nec Osten Sacken), U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 92, p. 13 (partim), 1897.—Howard and Fiske, U. S. Dept. Agr., Bur. Ent., Bull. 91, pp. 90, 140–142, 1911.

Eusisyropa blanda of Smith (nec Osten Sacken), Catalogue of New Jersey insects, p. 779, 1909.

Zenillia blanda virilis Aldrich and Webber, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 37–40, 1924.—Johnson, List of New England Diptera p. 197, 1925.

Zenillia virilis Aldrich and Webber, Sellers, Ann. Ent. Soc. Amer., vol. 23, pp. 569–576, 1930.—Schaffner and Griswold, U. S. Dept. Agr. Misc. Publ. 188, p. 113, 1934.

Coquillett considered this species to be *Exorista blanda* Osten Sacken. Aldrich and Webber were only able to separate the males of *Zenillia blanda* and *Z. virilis*. The identity of the two species was discussed by the writer in the Annals of the Entomological Society of America in 1930.

Type locality.—Rye, N. Y.

Distribution.—Maine 9, New Hampshire 2, Massachusetts 9, Connecticut 4, Rhode Island 1, New York 3, New Jersey 6, Pennsylvania 1, Maryland 2, Virginia 2, Illinois 1, Kansas 1, Colorado 1, New Mexico 2, Mexico 3. Published records not duplicated above: Massachusetts 3 (Howard and Fiske), New Hampshire (Coquillett), Pennsylvania (Coquillett).

Type.—Male, U.S.N.M. No. 25698.

Hosts.—*Papaipema harrisii* (Grote) 1, *Ennomos subsignarius* (Hübner) 1, *Porthetria dispar* (Linnaeus) 8, *Danaus plexippus* (Linnaeus) 1, *Simyra henrici* (Grote) 1, *Acrionicta dactylina* (Grote) 1, *A. impressa* Walker 3, *A. grisea* Walker 1, *A. leporina vulpina*

(Grote) 17, *Callosamia promethea* (Drury) 5, *Ceratonia catalpae* (Boisduval) 3, *Anacamptodes ephyraria* (Walker) 1, *Gluphisia septentrionis* Walker 5, *Polia legitima* (Grote) 1, *Ichthyura albosigma* (Fitch) 1, *Ichthyura strigosa* Grote 1, *Phigalia titea* (Cramer) 2, *Cingilia catenaria* (Drury) 15, *Proteides clarus* (Cramer) 1, *Phosphila turbulenta* Hübner 2, *Pyphantria cunea* (Drury) 2, *Vanessa atalanta* (Linnaeus) 1. Published and unpublished records not duplicated above: *Euclea delphinii* Boisduval as *cippus* Cramer (Coquillett); *Porthetria dispar* (Howard and Fiske); *Polygonia interrogationis* (Fabricius), *Platysamia cecropia* (Linnaeus), *Acronicta oblinata* Abbott and Smith (Schaffner and Griswold).

Remarks.—The material examined consisted of the male type reared from *Papaipema harrisii* (Bird); 4 male paratypes bearing Gypsy Moth Laboratory numbers—ex *E. subsignarius* No. 10029, ex *C. catenaria* No. 12418 F5, ex *P. dispar* No. 4365C, and *Danaus pleuippus* No. 5904; 1 male paratype, Lawrence, Kans. (Aldrich); 1 male paratype, Dist. Federal Mexico (Conrad); 57 reared specimens bearing Gypsy Moth Laboratory numbers; 3 males and 7 females reared from *Cingilia catenaria* (Dimmock, No. 934); 1 female ex unknown host, Arendtsville, Pa. (Frost); collected specimens, 4 males and 18 females (Aldrich, Shannon, Smyth, Barber, Coquillett, Townsend, Tucker).

The male type had one very weak inner ventral bristle on the mid-tibia.

Adults, June to September; number per host, one to five; generations, one or two; hibernation, as larva in host pupa.

8. ZENILLIA BLANDITA (Coquillett)

Exorista blandita COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 96, 1897.

Zenillia blandita (Coquillett) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 40-41, 1924.—JOHNSON, List of New England Diptera, p. 197, 1925.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.—SELLERS, Ann. Ent. Soc. Amer., vol. 23, pp. 569-576, 1930.

The status of this species was discussed by the writer in the Annals of the Entomological Society of America in 1930.

Type locality.—Franconia, N. H.

Distribution.—New Hampshire 1, Massachusetts 2, District of Columbia. Published records not duplicated above: Rhode Island (Johnson), New York (West), District of Columbia (Aldrich and Webber).

Type.—Female, U.S.N.M. No. 3592.

Hosts.—Published record: Aldrich and Webber list *Sarrothripus verayanus* (Scopoli) (Walton MS.).

9. ZENILLIA BLANDA (Osten Sacken)

- Exorista blanda* OSTEN SACKEN, Can. Ent., vol. 19, pp. 162-163, 1887.—WILLISTON, Scudder's Butterflies of Eastern United States and Canada, vol. 3, p. 1918, pl. 89, fig. 11, 1889.
- Exorista blanda proserpina* WILLISTON, Scudder's Butterflies of Eastern United States and Canada, vol. 3, p. 1919, 1889.
- Exorista boarmiae* COQUILLET (partim), U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, pp. 13, 95, 1897.
- Eusisyropa blanda* (Osten Sacken) TOWNSEND, Smithsonian Misc. Coll., vol. 51, No. 2, p. 97, 1908; U. S. Dept. Agr. Bur. Ent., Tech. Bull. 12, pt. 6, p. 116, 1908; Manual of myiology, pt. 4, p. 245, 1936.—COQUILLET, Proc. U. S. Nat. Mus., vol. 37, p. 543, 1910.
- Eusisyropa boarmiae* of SMITH (nec Coquillett), Catalogue of New Jersey insects, p. 780, 1909.
- Exorista boarmiae* of HOWARD and FISKE (nec Coquillett), U. S. Dept. Agr., Bur. Ent., Bull. 91, pp. 93, 145, 147-149, 1911.
- Zenillia blanda* (Osten Sacken) ALDRICH and WEBBER (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 37-40, 1924.—BOTTIMER, Journ. Agr. Res., vol. 33, pp. 800, 814, 1926.—ESSIG (partim), Insects of western North America, p. 581, 1926.—BURGESS and CROSSMAN, U. S. Dept. Agr. Dept. Bull. 1469, p. 14, 1927.—JOHNSON, Biological survey of Mount Desert region, insect fauna, pt. 1, p. 201, 1927.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.—SELLERS, Ann. Ent. Soc. Amer., vol. 23, pp. 569-576, 1930.—ALDRICH, Proc. U. S. Nat. Mus., vol. 80, art. 20, p. 2, 1932.—SCHAFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 111, 1934.
- Zenillia blanda blanda* (Osten Sacken) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 37-40, 1924.

In 1930, when the identity of *Zenillia blanda* (Osten Sacken) was explained, the writer had not seen the type material of *Exorista boarmiae* Coquillett. An examination showed that the original material, other than the type specimen *boarmiae*, included some specimens of *Exorista blanda* Osten Sacken. As explained, *Exorista blanda* of Coquillett (nec Osten Sacken) equals *Zenillia virilis* Aldrich and Webber.

The recognition of *boarmiae* Coquillett as a valid species creates a certain amount of confusion in the bibliography of the species *blanda* and *boarmiae* that is unavoidable.

Type locality.—Unknown.

Distribution.—Maine 9, New Hampshire 3, Massachusetts 40, Rhode Island 11, Connecticut 2, New York 7, New Jersey 11, Pennsylvania 2, Texas 1, Arizona 2, Peru 2, Bolivia 1. Published records not duplicated above: New York 4 (West), New Jersey 4 (Smith), British Columbia (Hines). Questionable records: Texas (Bottimer), Colorado (Aldrich and Webber).

Type.—Museum of Comparative Zoology, Cambridge, Massachusetts.

Hosts.—*Vanessa cardui* (Linnaeus) 1, *Erynnis brizo* (Boisduval and LeConte) 1, *Isturgia truncataria* (Walker) (Coquillett listed as

Boarmia pampinaria) 1, *Archips cerasivorana* (Fitch) 101, *A. fervidana* (Clemens) 219, *Catocala* sp. 1, *Ennomos subsignarius* (Hübner) 4, *Calocalpe undulata* (Linnaeus) 9, *Notolophus antiqua* (Linnaeus) 1, *Nygmia phaeorrhoea* (Donovan) 1, *Sphécodina abbottii* Swainson) 1, *Thyridopteryx ephemeraeformis* (Haworth) 1, tortricid on sumac 2, *Cingilia catenaria* (Drury) 37, *Proteides clarus* (Cramer) 2, *Phosphila turbulenta* Hübner 9, *Hyphantria cunea* (Drury) 12, *Vanessa atalanta* (Linnaeus) 2, *Depressaria heracliana* (Linnaeus) 1, *Acrobasis comptoniella* Hulst 1, larva on *Comptonia peregrina* (Linnaeus) Coulter (*Myrica asplenifolia* Linnaeus) 1, oak-worm 1, gelechiid webber on willow 2. Published records not duplicated above: *Archips argyrospila* (Walker) (Gill), *Stilpnotia salicis* (Linnaeus) (Burgess and Crossman), tortricid on poplar (Sellers), *Archips fervidana* (Clemens) (Smith), *Polygonia interrogationis* (Fabricius) (Schaffner and Griswold), *Smerinthus geminatus* (Say) (Schaffner and Griswold). Records questionably referred here: *Gretchena bolliana* (Slingerland) (Gill), *Anomis crosa* Hübner (Bottimer), *Filatima monotaeniella* (Bottimer).

Remarks.—The material examined consisted of the male type reared from *Vanessa cardui*; the male type of the var. *proserpina* Williston, reared from *Erynnis brizo*; the female reared from *Isturgia truncataria* and erroneously selected by Aldrich and Webber as the type of *boarmiae* Coquillett; 401 reared specimens bearing Gypsy Moth Laboratory numbers; one female reared from *Cingilia catenaria* (Dimmock No. 934); one female reared from larva on *Comptonia peregrina* (Linnaeus) Coulter (*Myrica asplenifolia* Linnaeus) (Dimmock No. 992); one female reared from oakworm (Scammell); one male and one female reared from *Ennomos subsignarius* (Knull); 2 females reared from gelechiid webber on willow (Brower); one male, Center Harbor, N. H. (Dyar; reared from *Acrobasis comptoniella*); collected specimens, five males and eight females (Townsend, Mann, Riley, and Dyar).

Concerning the puparia: Greene stated that in his specimen of *Exorista boarmiae* the second spiracular entrance from the bottom is rather long. In the *Zenillia blanda* puparia studied in 1930, this entrance did not seem to be constantly longer than the one immediately above it; the spiracular entrances were simpler and less convoluted.

Adults, June to October; number per host, usually one; generations, one or two; hibernation, as larva in host pupa. An interesting observation that indicated the limiting factor controlling the number of generations per year for this species and *Zenillia virilis* was as follows: If parasitic on hosts producing adults the same season, the parasites completed their development that season; but if para-

sitic on hosts that pass the winter in the pupal stage and emerge the following spring or summer, the flies did not emerge until the following spring.

10. *ZENILLIA TUCUMANENSIS*, new species

This species is similar to *Zenillia blanda*, but the characters given in the key, frontal orbit brassy or golden and fourth segment golden pollinose, will serve to separate it readily. The ratio of the front of the male at the narrowest point in relation to the head width is greater than in *blanda* (0.21–0.23) or *boarmiae* (0.20–0.22); this is not so noticeable in the females.

Male (type).—Head with front at narrowest 0.26 head width; frontal row of six bristles, extending from on a level with base of third antennal segment to two reclinate preverticals; facial ridge bristly on lowest one-sixth; gena one-seventh eye height; frontal orbit brassy or golden-pollinose; antenna black, third segment four and one-half times second. Abdomen with fourth segment golden pollinose contrasting with gray of other segments.

Female (allotype).—Front 0.28 head width; five frontal bristles; third segment of the antenna three and three-fourths times second. Otherwise the description is the same as for the male.

The paratype material varies as follows from the descriptions above: Female with front 0.28 to 0.30; male and female with five or six frontal bristles; third antennal segment in male four and one-fourth to four and one-half, in female three and one-half to three and three-fourths, times second.

Type locality.—Tucuman, Argentina.

Type.—Male, U.S.N.M. No. 54134.

Host.—Unknown.

Remarks.—The description is based on an examination of the type, allotype, two male paratypes, and three female paratypes reared from an unknown host, Tucuman, Argentina, Est. Exp. A. C. No. 310 (Rust). The material issued from April 12–30, 1917.

The bottom spiracular entrances of the stigmal plates of the puparia are a little more convoluted than in *blanda*.

11. *ZENILLIA BOARMIAE* (Coquillett), new combination

Exorista boarmiae COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 95, 1897.—CHITTENDEN, U. S. Dept. Agr., Div. Ent., Bull. 66, p. 26, 1910.—SHERMAN, Journ. Econ. Ent., vol. 13, p. 295, 1920.—BRIMLEY, Ent. News, vol. 33, p. 22, 1922.—GREENE, Proc. U. S. Nat. Mus., vol. 60, art. 10, p. 16, pl. 6, fig. 25 (puparium), 1922.—LEBY, North Carolina Dept. Agr. Bull., Feb. 1925, p. 9.—SELLERS, Ann. Ent. Soc. Amer., vol. 23, pp. 569–576, 1930.

Exorista hypenae Coquillett MS., HOWARD, U. S. Dept. Agr. Bur. Ent., Bull. 7, n. s., p. 47, 1897.—HAWLEY, Cornell Univ. Agr. Exp. Stat., Mem. 15, p. 196, 1918.

- Eusisyropa boarmiae* (Coquillett) TOWNSEND, Smithsonian Misc. Coll., vol. 51, No. 2, p. 98, 1908.
- Zenillia blanda blanda* (Osten Sacken) ALDRICH and WEBBER (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 37-40, 1924.
- Exorista blanda* of HILL (nec Osten Sacken), U. S. Dept. Agr. Dept., Bull. 1336, pp. 17, 18, 1925.
- Zenillia blanda* of ESSIG (nec Osten Sacken), Insects of western North America, p. 581, 1926.

Coquillett placed the type label of *Exorista boarmiae* on the specimen labeled "No. 468 L^o Nov. 14, 82." When Townsend discussed the genus *Eusisyropa* in 1908, his designation of this specimen as being the type makes it in any case the lectotype of *boarmiae*. In 1924 Aldrich and Webber wrote, "(This specimen was erroneously labeled as type of *boarmiae*, but was not originally included)." Coquillett originally included four males and three females, and Aldrich and Webber did not present any evidence to prove that the above labeled female reared from *Alabama argillacea* (Hübner) was not one of the three original females. They changed the type label to a specimen that had been reared from *Isturgia truncataria* (Walker) saying "Coquillett (Revis., p. 13), erroneously gives the host as *Boarmiae pampinaria*, from which he named the supposed new species *boarmiae*. Obviously this specimen should be the type of *boarmiae*, and we have so labeled it." The female which they labeled as the type of *Exorista boarmiae* is *Zenillia blanda* Osten Sacken. Under any circumstances the transfer of the type label to this specimen is untenable. Similar instances indicate that Coquillett based his names not necessarily on the host rearing from which he selected the type specimen, but on the name of the host from which his records indicated that it was first reared.

Type locality.—Mississippi.

Distribution.—Mississippi 1, Arkansas 1, Florida 2. Published and unpublished records not duplicated above. North Carolina (Brimley, Leiby), District of Columbia (Coquillett), Texas (Aldrich's notes). Coquillett's record of Boston, Mass., refers to *Zenillia blanda*.

Type.—Female, U.S.N.M. No. 3591.

Hosts.—*Alabama argillacea* (Hübner) 1, *Hypena humuli* (Harris) 1, *Loxostege similalis* Guénéée, *Plathypena scabra* (Fabricius) 1, *Dichogama redtenbacheri* Lederer 3, *Hyphantria cunea* (Drury) 1. Published records probably not duplicated above: *Plathypena scabra* (Fabricius) (Chittenden, Sherman, Hill). Records questionably referred here: *Acrobasis juglandis* (Le Baron) (Brimley); green clover worm pupae (Brimley); *Acrobasis* sp. (Fabis) (Aldrich's notes).

Remarks.—The material examined consisted of the female type reared from *Alabama argillacea*; two males reared from *Loxostege*

similalis, one of which has a paratype label (Avera, 439 L^{o 1}); one male reared from *Hypena humuli*, No. 185^o (*Exorista hypenae* Coquillett Ms.); one female 359^o Form a, June 1, 1875; one female reared from *H. texator*, 78^{o 3}, April 19, 1887; one female reared from *Plathypena scabra*, U. S. D. A. Ent. No. 38; two males and one female reared from *Dichogama redtenbacheri*, L^o (Dyar); one male and one female, Gainesville, Fla. (J. R. W.).

The puparium has been featured by Greene. The differences from *Zenillia blanda* were discussed under *blanda*.

12. ZENILLIA AUTOGRAPHAE, new species

Zenillia blanda blanda (Osten Sacken) ALDRICH and WEBBER (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 37-40, 1924.

This species is similar to *Zenillia boarmiae*, but it is distinctively yellower. The male genitalia are the same as in *Zenillia blanda* but with the tip of the inner forceps straight instead of bent at an obtuse angle.

Male (type).—Head with front at narrowest 0.21 of head width; frontal row of seven bristles, extending from on a level with base of third antennal segment to two reclinate preverticals; facial ridge bristly on the lowest one-fifth; gena one-eighth eye height; frontal orbit silvery white; antenna black with first and second segments yellow, third joint four times second; arista thickened on basal one-fourth, penultimate segment short; palpus yellow.

Thorax black, heavy gray-pollinose marked with four mesonotal vittae; midtibia with one median anterolateral bristle, no inner ventral bristle; hind tibia ciliate, with one longer bristle.

Abdomen heavy gray pollinose; discal and marginal macrochaetae arranged as in *blanda*.

Female (allotype).—Front 0.25 head width; six frontal bristles; third segment of antenna three and three-fourths times second. Otherwise the description is the same as for the male.

One female paratype has two median anterolateral bristles on the midtibia.

Type locality.—Baraguá, Cuba.

Distribution.—Cuba 3.

Type.—Male, U.S.N.M. No. 54135.

Host.—*Autographa brassicae* (Riley) 2. This was previously reported by Aldrich and Webber as a host of *Zenillia blanda blanda* Osten Sacken.

Remarks.—Material examined consisted of type T. P. R. F. Ent. No. 3657D reared from T. P. R. F. 3469, Baraguá, Cuba, September 20, 1929 (Scaramuzza); allotype and female paratype, same locality and data, No. 3657B and No. 3657C; two female paratypes, reared

from *Autographa brassicae* Est. Cent. Agr. de Cuba, No. 8098a, April 22, 1916, Santiago de las Vegas; one female paratype, Baracoa, Cuba, September 1901 (Busck).

The spiracular entrances of the puparial stigmata are much more serpentine and convoluted than those of *Zenillia blanda*.

13. ZENILLIA MARGINATA Aldrich and Webber

Zenillia marginata ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 17, 1924.

Head with front of female at narrowest 0.28 head width; frontal row of seven bristles, if small ones are counted, otherwise four, extending from on a level with base of third antennal segment to the two reclinate preverticals; vertical and weak outer vertical bristles; facial ridge bristly on lowest one-fifth; gena one-sixth eye height, grayish pruinose with a yellow tinge; frontal orbit and face golden-pollinose, face slightly less so; antenna black, third segment three times length of second; arista thickened on basal one-third, penultimate segment short; palpus yellow.

Thorax black, golden pollinose marked with four mesonotal vittae; scutellum yellow, three pairs of marginal scutellars, one pair of discal scutellars; legs black; midtibia with one medium anterolateral bristle, one inner ventral bristle; hind tibia ciliate with one longer bristle.

Abdomen black covered with golden pollen; first segment and apical margins of segments 2 and 3 shining black; venter gray pollinose; first and second segments with a pair and third with a row of marginal macrochaetae; second and third segments with a pair and fourth with a row of discal macrochaetae; fourth segment with marginal bristles.

Length 7 mm.

Type locality.—Boulder, Colo.

Type.—Female, U.S.N.M. No. 25700.

Host.—Unknown.

Remarks.—The type was collected October 13, 1917 (Cockerell). In life this fly has a splendid golden color.

The female mentioned by Aldrich and Webber as being from Cornelia, Ga., is considered under *Zenillia dawsoni*, new species.

Aldrich and Webber confused *angustifrons* Townsend with *marginata*. *Zenillia angustifrons* is a distinct species.

14. ZENILLIA FULGORIS, new species

Zenillia ochracea (Van der Wulp) ALDRICH and WEBBER (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 16-17, 1924.

Male (type).—Head with front at narrowest 0.30 head width, frontal row of seven or eight bristles, extending from below base of third antennal segment to two reclinate preverticals; facial ridges

bristly on lowest one-fifth; gena one-fifth eye height; frontal orbit golden, face, gena, and posterior orbit a little less so; antenna black, first and second segments obscurely rufous, third segment five times length of second; arista thickened on basal one-third, penultimate segment short; palpus yellow.

Thorax golden-pollinose, marked with four black mesonotal vittae; scutellum golden-pollinose, three pairs of marginal scutellars, discal scutellars if at all noticeable barely distinguishable from surrounding hairs; midtibia ciliate; wing with three and four bristles at base of third vein.

Abdomen covered with golden pollen which extends under on to the venter, the golden pollen much more gleaming than in *ochracea*, whose brownish tinge dulls the pollen; first segment shining black, gray-pollinose on venter; segments 2, 3, and 4 golden-pollinose on basal two-thirds to three-fourth, the shining black margins of second and third segments slightly V-shaped; first segment with a pair of marginal macrochaetae; second segment with a pair of discal and marginal macrochaetae; third segment with a pair of discal and a marginal row of macrochaetae; fourth segment with a discal and a marginal row of macrochaetae.

Hypopygium brownish black; inner and outer forceps of same length; outer forceps narrow and straight, and of same width throughout, with a blunt ending, tapering only slightly toward apex; outer forceps of *ochracea* wide, tapering gradually to a point, curving inward.

Female (allotype).—Front 0.32; frontal bristles six and seven in number; outer vertical bristle present; two fronto-orbital bristles; third antennal segment four and one-half times length of second. Two pairs of marginal scutellars; wing with two and three bristles at base of third vein. Otherwise the description is much the same as for the male.

The male paratype has only six frontal bristles; the third vein has one and two bristles at the base.

Type locality.—Hell Canyon, Manzano National Forest, N. Mex.

Type.—Male, U.S.N.M. No. 54136.

Host.—Unknown.

Remarks.—The type was collected by Townsend September 18, 1916, the allotype September 19, 1916, and the male paratype September 12, 1916, at an altitude of 7,200 feet.

15. ZENILLIA TAGLINOI, new species

Female (type).—Head with front at narrowest 0.28 head width; frontal row of four bristles, extending upward to two reclinate preverticals, first prevertical situated halfway between base of antenna

and vertical bristle; outer vertical rather weak; facial ridge bristly on lowest one-fifth; gena one-fifth eye-height, covered with white hairs, a row of black bristles along its anterior margin; third segment of antenna three and one-half to four times second; arista thickened on basal one-third, penultimate segment short; palpus yellow.

Thorax covered with golden-brownish pollen, marked with four black mesonotal vittae; scutellum golden brownish pollinose, three pairs of marginal macrochaetae, one pair of discal scutellars; middle tibia with one long median anterolateral bristle, one inner ventral bristle; wing more or less brownish along veins; third vein with three bristles at base.

Abdomen gray-pollinose underneath on venter, basal three-fourths of segments 2 and 3, and basal four-fifths of segment 4 golden-pollinose, heavily covered with a brilliant green; dorsum of first segments and apical borders of others shining black; first and second segments with a pair and the third and fourth with a row of marginal macrochaetae; second and third segments with a pair and the fourth with a row of discal macrochaetae.

Type locality.—Tafi Viejo, Tucuman, Argentina.

Type.—Female, U.S.N.M. No. 54137.

Host.—Unknown.

Remarks.—The material examined consisted of one female, Tafi Viejo, Tucuman, March 14, 1927 (Shannon), labeled "*Exorista coeruleiventris* V.d.W." "comp. type J.M.A." This specimen is not *Zenillia lineata* (Van der Wulp) (= *Exorista coeruleiventris* Van der Wulp).

16. ZENILLIA VIRIDIS (Townsend), new combination

Chrysoexorista viridis TOWNSEND, Proc. U. S. Nat. Mus., vol. 49, p. 435, 1915; Rev. Mus. Paulista, vol. 15, p. 265, 1926; Manual of myiology, pt. 4, pp. 94, 271, 1936.

Townsend's male allotype of *Chrysoexorista viridis*, U.S.N.M. No. 19611, is the type and genotype of *Chrysoephyxæ*, new genus, *tibialis*, new species. Townsend's *angustifrons* (*Chrysoexorista*) is not synonymous with *viridis* Townsend.

Head with front of male at narrowest 0.24 and in female 0.27 the head width; frontal row of seven bristles, extending from on a level with the insertion of arista to the two reclinate preverticals; female with and male without outer vertical bristle; facial ridge bristly on the lowest one-fifth; gena one-fifth eye height; third segment of antenna in male four times and in female three and one-half times the second; arista thickened on basal one-third, penultimate segment short; palpus yellow.

Thorax covered with heavy golden-brown pollen, marked by four black mesonotal vittae; scutellum heavy golden-brown pollinose, three

pairs of marginal scutellars, one pair of discal scutellars; midtibia with one median anterolateral bristle, male lacking and female with one inner ventral bristle; hind tibia weakly ciliate with one longer bristle; wing with two or three bristles at base of third vein.

Abdomen with venter gray-pollinose on segments 1, 2, and 3; basal three-fourths of segments 2 and 3 and fourth segment almost entirely golden-brown pollinose; in certain reflections, dorsum of segment 3 of female with one or two green patches; dorsum of first segment, apical borders of segments 2 and 3, and the tip of segment 4 shining black; first and second segments with a pair and the third and fourth with a row of marginal macrochaetae; second and third segments with a pair and fourth with a row of discal macrochaetae.

Hypopygium brown; inner and outer forceps of the same length; outer forceps broad and leaf shaped, inner forceps blunt and spoon or cup shaped, narrowing toward the center and then broadening apically.

Type locality.—Casahuari San Gaban Canyon, Peru.

Distribution.—Peru 2.

Type.—Female, U.S.N.M. No. 19611.

Host.—Unknown.

Remarks.—The material examined consisted of the type female, Casahuari San Gaban Canyon, mountains of southeastern Peru, 4,500 feet, February 4, 1910 (Townsend); one male R. Charape, Peru, 4,500 feet, September 13, 1911 (Townsend).

The male that Townsend called the allotype does not belong here. The type female is not abnormal and is very similar to the male from Peru whose hypopygium has been described above. The chaetotaxy and coloration agree, and the two forms should be associated as the same species.

17. ZENILLIA LINEATA (Van der Wulp), new combination

Mystacella lineata VAN DER WULP, *Biologia Centrali-Americana*, Diptera, vol. 2, p. 54, 1890.

Exorista coeruleiventris VAN DER WULP, *Biologia Centrali-Americana*, Diptera, vol. 2, p. 64, 1890.

Remarks.—The writer had the privilege of examining the type material consisting of one male and one female of *Mystacella lineata* Van der Wulp and one female of *Exorista coeruleiventris* Van der Wulp. The females of both species are the same, which would confirm the synonymy.

All three specimens were noted as having four postsutural dorso-central macrochaetae, whereas the type specimen of *Zenillia taglinoi*, which Aldrich labeled "*Exorista coeruleiventris* V.d.W." "comp. type J.M.A." has only three postsutural dorso-central macrochaetae.

Although the additional notes by the writer are rather incomplete, *Zenillia lineata* (Van der Wulp) is a species with four postsutural dorsocentral macrochaetae that in other respects closely resembles *Z. taglinoi*. Van der Wulp's specimen of *coeruleiventris* does not have the brilliant green color that the pollen of the abdomen of *Z. taglinoi* has.

18. *ZENILLIA FACIALIS*, new species

Male (type).—Head with front at narrowest 0.31 head width; all bristles on head missing, but scars indicating frontal row of eight bristles, extending from on a level with base of third antennal segment to two reclinate preverticals; ocellar, vertical, and perhaps weak outer vertical bristles; parafacial with a few fine hairs on the upper part which are directed downward; facial ridge apparently bristly on lowest one-fifth; gena one-fourth eye height; first and second segments of antenna yellow; third segment black, three times length of second; arista missing; palpus yellow.

Thorax golden-pollinose marked with at least four black mesonotal vittae; scutellum golden-pollinose, three pairs of marginal scutellars and one strong decussate apical pair turned backward, one pair of discal scutellars; pulvilli elongate, midtibia with one median anterolateral bristle, one strong inner ventral bristle; hind tibia unevenly ciliate; wing with four bristles at base of third vein.

Abdomen black with sides reddish, venter gray-pollinose; basal three-fourth of segments two and three and basal two-thirds of segment four yellow-pollinose overlaid with green; dorsum of first segment and apical margins of other segments shining black; first and second segments with a pair, and third and fourth with a row of marginal macrochaetae; discal macrochaetae lacking on second segment, a pair on third, and a row on fourth.

Hypopygium with outer forceps broad, leaflike, and triangular; of same length as the inner, which is curved inwardly at the tip.

Length 10 mm.

Type locality.—St. Lucrecia, Veracruz, Mexico.

Type.—Male, U.S.N.M. No. 54138.

Host.—Unknown.

Remarks.—Described from a badly rubbed specimen collected August 4, 1923 (E. G. Smyth). It was removed from *Zenillia ochracea* material, but it is a decidedly distinctive species.

An additional male in excellent condition was found in the collection after the above-described male had been cataloged as the type specimen, and it has been labeled as the paratype of No. 54138. It has eight frontal bristles and the facial ridges are bristly on the lowest two-fifths. Collected at Trujillo, Peru, December 14, 1938 (Jaynes).

19. ZENILLIA DAWSONI, new species

Zenillia marginata ALDRICH and WEBBER (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 17, 1924.

Male (type).—Head with front at narrowest 0.27 head width; frontal row of seven bristles on one side and six on the other, extending from on a level with base of third antennal segment to the two reclinate preverticals; no outer vertical bristle; facial ridge bristly on lowest one-fifth; gena one-sixth eye height, grayish pruinose with a yellow tinge; frontal orbit and face dull brown, golden-pollinose, face slightly less so; antenna black, third segment five times length of second; arista thickened on basal one-third, penultimate segment short; palpus yellow.

Thorax black, dull golden-pollinose, marked with four mesonotal vittae; scutellum black, heavily covered with golden pollen; three pairs of marginal scutellars and one shorter apical pair erect or proclinate, one pair of discal scutellars; legs reddish brown; midtibia with one median anterolateral bristle, inner ventral bristle lacking; hind tibia ciliate.

Abdomen black covered with dull-brownish-gold pollen; first segment shining black, narrow apical margins of segments 2 and 3 shining black, not distinct, tending to blend with pollen; first and second segments with a pair and third and fourth with a row of marginal macrochaetae; second and third segments with a pair and fourth with a row of discal macrochaetae.

Length 8.5 mm.

Female (allotype).—Front at narrowest 0.28 head width; four frontal bristles: with outer vertical bristle; third segment of antenna four times the second. Midtibia with inner ventral bristle. Otherwise the description is much the same as for the male.

There is one female paratype. It has five frontal bristles.

Type and allotype locality.—Dawson Camp, Ariz.

Distribution.—Arizona 1; New Mexico 2; Georgia 1.

Type.—Male, U.S.N.M. No. 54139.

Hosts.—*Ellopia lactea* (Hulst) 1; under *Carpocapsa pomonella* (Linnaeus) band 1.

Remarks.—The material examined consisted of the type and allotype collected at Dawson Camp on September 7, 1917 (Townsend); one female paratype collected September 12, 1916, at Hell Canyon, N. Mex., elevation 7,200 feet (Townsend); one female is from Cornelia, Ga., under codling-moth band, August 30, 1921 (Van Leenwen), the abdomen a little less golden; one female reared from *E. lactea* September 15, 1923, Lincoln National Forest, N. Mex. (Eldridge).

20. *ZENILLIA ANGUSTIFRONS* (Townsend), new combination

Chrysocrorista viridis angustifrons TOWNSEND, Bull. Amer. Mus. Nat. Hist., vol. 35, p. 21, 1916; Manual of myiology, pt. 4, p. 271, 1936.

Zenillia marginata ALDRICH and WEBBER (partim), Proc. U. S. Nat. Mus., vol. 63 art. 17, pp. 17-18, 1924.

Head with front of male at narrowest 0.29 head width; frontal row of six bristles, extending from on a level below insertion of arista to two reclinate preverticals; no outer vertical bristle; facial ridge bristly on lowest one-sixth; gena one-seventh eye height; antenna black, second segment obscurely rufous, third segment six times the length of second; arista thickened on basal one-third, penultimate segment short; palpus yellow.

Thorax and scutellum heavy golden-brown pollinose; four mesonotal vittae; three pairs of marginal scutellars and one weak decussate apical pair, one pair of discal scutellars; legs reddish brown; mid-tibia with one median anterolateral bristle, one very weak inner ventral bristle; hind tibia ciliate, with one longer bristle; wing with two to three bristles at base of third vein.

Abdomen black covered with golden-pollinose, some specimens flecked with green; first segment, apical one-fourth to one-third of segments 2 and 3, and tip of fourth segment shining black; venter gray-pollinose; first and second segments with a pair and third and fourth with a row of marginal macrochaetae; second and third segments with a pair and fourth with a row of discal macrochaetae.

Hypopygium, inner and outer forceps of about the same width and length, narrow, tapering slightly, slightly concave.

Paratype locality.—Nova Chapada, Brazil.

Distribution.—Brazil 1, Bolivia 1.

Paratype.—Male, U.S.N.M. No. 20013.

Host.—Unknown.

Remarks.—Description based on one male paratype (Williston); one male labeled same as paratype; and seven males Rurrenabaque Beni, Bolivia, 1921-22 (Mann).

21. *ZENILLIA OCHRACEA* (Van der Wulp)

Exorista ochracea VAN DER WULP, Biologia Centrali-Americana, Diptera, vol. 2, p. 63, 1890.—VAN LEEUWEN, U. S. Dept. Agr. Techn. Bull. 90, p. 78, 1929.

Chryomasicra borealis TOWNSEND, Journ. New York Ent. Soc., vol. 23, pp. 230-231, 1915; Manual of myiology, pt. 4, p. 112, 1936.

Zenillia ochracea (Van der Wulp) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 16-17, 1924.

Head with front of male at narrowest 0.28 and of female 0.31 of head width; frontal row of eight bristles in male and six or seven in female, extending from on a level below insertion of arista to two reclinate preverticals in male and one in female; female only with

outer vertical bristle; facial ridge bristly on lowest one-fifth to one-fourth; gena one-fourth to one-third eye height; antenna black, third segment in male four and one-half to five and in female three times the second; arista thickened on basal two-fifths, penultimate segment short; palpus yellow.

Thorax dull golden-pollinose; four mesonotal vittae; scutellum yellowish with three pairs of marginal scutellars and one decussate apical pair turned backward, one pair of discal scutellars; legs reddish brown or black; midtibia with one median anterolateral bristle, female with one shorter bristle above on anterolateral side, one inner ventral bristle; hind tibia ciliate.

Abdomen golden-pollinose with a brownish tinge; first segment, apical one-fourth to one-third of segments 2 and 3, and vitta on second segment, black; apical border of pollen slightly V-shaped inward, making a broad obtuse angle; first and second segments with a pair and third and fourth with a row of marginal macrochaetae; second and third segments with a pair and fourth with a row of discal macrochaetae.

Hypopygium, inner and outer forceps of same length, outer forceps wide, tapering gradually to a point, curving inward.

Type localities.—Mexico and New Mexico.

Distribution.—Mexico 7, Costa Rica 1, New Mexico 1.

Type.—Type series of *Exorista ochracea*, British Museum. *Chrysoasicera borealis*, male, U.S.N.M. No. 19613.

Host.—Unknown.

Remarks.—Description based on an examination of the following material: Type male of *Chrysoasicera borealis* labeled "Top of Las Vegas Range, N. Mex., June 28. In life brilliant golden shot with green"; one female, Las Vegas, N. Mex., August 4 (Barber); one male, Atzacapotzaltongo, Mexico, August 31, 1922 (Smith); and one female, Mexico City, Mexico (Muller). Dr. Aldrich examined the type material of *ochracea* in the British Museum, and he was of the opinion that *borealis* is a synonym of *ochracea*.

The writer had the privilege of examining the type series of *Exorista ochracea*. This series is a composite mixture of species, some specimens of which resemble *borealis*.

2. Genus PHRYXE Robineau-Desvoidy

Phryxe ROBINEAU-DESVOIDY, Mém. Acad. Sci. Inst. France, vol. 2, p. 158, 1830; Histoire naturelle des diptères des environs de Paris, vol. 1, p. 329 [on page 358 (*P. athaliae* Robineau-Desvoidy) = *Tachina vulgaris* Fallen], 1863.—COQUILET, Proc. U. S. Nat. Mus., vol. 37, p. 589, 1910.—TOWNSEND, Manual of myiology, pt. 4, pp. 220–221, 224–226, 272, 280, 1936. (Genotype, (*P. athaliae*) = *Tachina vulgaris* Fallen. By designation of Robineau-Desvoidy, 1833, in synonymy.)

Blepharidea RONDANI, Dipterologiae italicae prodromus, vol. 1, p. 67, 1856.

(Genotype, *Tachina vulgaris* Fallen. Monotypic.)

Exorista of COQUILLETT (nec Meigen), partim, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 93, 1897.

Zenillia of ALDRICH and WEBBER (nec Robineau-Desvoidy), partim, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 26-28, 1924.

Plagiophryxe TOWNSEND, Insector Inscitiae Menstruus, vol. 14, p. 33, 1926. (Genotype, *P. pecosensis* Townsend. By original designation.)

This genus is small and compact with only two species known to occur in the Nearctic realm. One species is Palearctic and the other Nearctic. The various Palearctic concepts of the *Phryxe* complex have yet to be reconciled. Although the generic characters usually cited by previous revisers are weak, the genus *Phryxe* (s. s.) is fairly well agreed upon. Aldrich and Webber's concept of *Phryxe* is not tenable. *Phryxe* is closely related to the genera *Madremyia* and *Thelymyia*. The main difference between *Phryxe* and *Madremyia* is that in the latter the facial ridges are bristly above the middle and the second segment of the arista is more elongated. Townsend places *Phryxe* in the tribe Lydellini and *Madremyia* in the tribe Frontinini.

The front at the vertex or narrowest part is more than one-third the head width, often being two-fifths. This character, coupled with the sexual characters that the front of the male is equal to the front of the female and that the claws and pulvilli are small in both sexes, serves to separate the genera *Phryxe* and *Thelymyia* from the other genera. *Phryxe* is separated from *Thelymyia* by apical scutellars erect or proclinate, decussate; palpus black; four dorsocentral macrochaetae; male without frontal orbital bristle.

KEY TO THE SPECIES OF PHRYXE¹³

1. Species definitely pollinose; thorax grayish pruinose with decided bluish tinge (especially noticeable if viewed without use of artificial light), five definite mesonotal vittae discernible behind suture, median one obsolete before suture; abdomen gray-pruinose with bluish tinge, narrow and fairly well defined hind margins on segments 2, 3, and 4 and median dorsal vitta shining black, the heavy pollen (silverly in artificial light) broadly present and pronounced on median dorsal region of segments 2, 3, and 4 in the various lights. Palpus varying from usual pale or yellowish brown to brownish black; midtibia with usually two long easily noted median anterolateral bristles, usually only one above longest middle bristle; one long and one very short inner ventral bristle on midtibia; hind tibia exhibiting some tendency to be subciliate; sides of male and female abdomens distinctly red----- 1. *vulgaris* (Fallen) (p. 33)
- Species less definitely or more thinly pollinose, subshining black; thorax so thinly grayish pruinose with a bluish tinge that mesonotal vittae are not

¹³ One must experiment with holding the specimens in various positions in the light so that the pollen or pruinosity pattern is symmetrical; otherwise this characteristic will not be of much value. Pollen patterns have a sound value, but they are deceptive and difficult to use.

or are only with the greatest of difficulty discernible behind suture, and the four vittae before suture can be seen with difficulty; abdomen less definitely primrose, broad and poorly defined hind margins on segments 2, 3, and 4 and an indistinct median dorsal vitta shining black, the heavy pollen confined mostly to sides of abdomen and to a narrow basal margin or entirely absent in median dorsal area of segments 2, 3, and 4 in various lights. Palpus brownish black to black; midtibia more bristly, especially in female, with three or more easily noted median anterolateral bristles, usually two bristles above longest middle one; midtibia with one long and one shorter inner ventral bristle, the shorter one often approaching or in vicinity of half the length of the longer; hind tibia with uneven bristles; sometimes fourth segment almost wholly shining black; sides of female abdomen black or only slightly red

2. *pecosensis* (Townsend) (p. 35)

1. *PHRYXE VULGARIS* (Fallen) (genotype)

The complete synonymy is so voluminous that considerable of the early portion is not cited. For a more complete record the reader is referred to Bezzi and Stein, Coquillett, Aldrich and Webber, Lundbeck, and Townsend.

Tachina vulgaris FALLÉN, Svenska Vet.-Akad. Handl., vol. 31, p. 275, 1810.

Phryxe athaliae and 21 other species, ROBINEAU-DESVOIDY, Mém. Acad. Sci. Inst. France, vol. 2, pp. 159-170, 1830. (Synonymy, Bezzi and Stein, 1907.)

Blepharidca vulgaris (Fallen) RONDANI, Dipterologiae Italicae prodromus, vol. 1, p. 67, 1856.—HOWARD and FISKE, U. S. Dept. Agr., Bur. Ent., Bull. 91, pp. 91, 136, 304, 1911.

Phryxe vulgaris (Fallen) ROBINEAU-DESVOIDY, Histoire naturelle des diptères des environs de Paris, vol. 1, pp. 329-458 (more than 200 additional names with "descriptions"), 1863.—BEZZI and STEIN, Katalog der paläarktischen Dipteren, vol. 3 (these authors placed at least 245 of Robineau-Desvoidy's names under *Phryxe vulgaris*), 1907.—COQUILLET, Proc. U. S. Nat. Mus., vol. 37, p. 589, 1910.—LUNDBECK, Diptera Danica, pt. 7, p. 334, 1927.—TOWNSEND, Manual of myiology, pt. 4, pp. 224-226, 1936.

Exorista hirsuta OSTEN SACKEN, Cal. Ent., vol. 19, p. 163, 1857.—WILLISTON, Scudder's Butterflies of Eastern United States and Canada, vol. 3, p. 1919, pl. 89, figs. 13-15, 1889.—TOWNSEND, Manual of myiology, pt. 4, p. 226, 1936.

Exorista vulgaris (Fallen) COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 93, 1897.—CHITTENDEN, U. S. Dept. Agr., Farmers' Bull. 1461, 1926.

Zenillia vulgaris (Fallen) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 26-28, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925; Biological Survey of Mount Desert region, The insect fauna, pt. 1, p. 201, 1927.—ESSIG, Insects of western North America, p. 581, 1926.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.—SCHAFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Pub. 188, p. 113, 1934.

Townsend considers *Phryxe hirsuta* (Osten Sacken) to be distinct from *P. vulgaris* and *P. pecosensis*, but closer to *vulgaris*. Townsend does not cite the differences, but this may be because Townsend believes that *vulgaris* does not occur in North America.

Head with front of male at narrowest 0.39 to 0.40 (in five specimens) and front of female 0.38 to 0.40 (in five specimens) of head width; red-

dish brown frontalia at least one-third width of front; frontal row of seven to nine bristles in male, six to eight in female, plus two reclinate upper frontals, often three in male, extending down below level of insertion of arista; in European males it has been noted there is a tendency toward some strong bristles outside the frontal row (this observation serves further to decrease the generic differences between *Phryxæ* and *Madremyia*); female with two proclinate fronto-orbital bristles; both sexes with outer vertical bristle; facial ridge bristly on lowest one-third to halfway; gena one-fourth eye height; frontal orbit silvery gray, slightly more blackish toward vertex, face and parafacial silvery white, gena silvery gray; antenna black, third segment in male nearly four times and in female nearly three times as long as the second segment; arista thickened on at least basal half, penultimate segment elongate, at least longer than broad; palpus varying from pale or yellowish brown to brownish black (the former are more apt to be those specimens from *Pieris rapae*; the palpi of the European specimens are uniformly darker than those of the American specimens).

Thorax black; scutellum bluish-gray pollinose, black at base, broad apex usually and tip always yellow, three long pairs of marginal scutellars and a shorter erect or proclinate decussate apical pair, one pair of discal scutellars; three sternopleural macrochaetae; front tibia with two bristles on median posterolateral side; wing a little tinged, third vein with two or three bristles at base; squamulae whitish.

Abdomen fairly well covered with pollen; abdominal hairs erect in male, some approaching macrochaetae in size in discal region, hairs suberect in female; second segment with a pair of discal and marginal macrochaetae; third with a pair of discals and a marginal row; fourth segment tipped with bristles and long fine hairs instead of macrochaetae, discals seeming to be irregularly placed and sometimes to follow roughly a row; sides of abdomen in male and usually only second abdominal segment in female with a somewhat variable red spot.

Length 7-9 mm. On the average this species is slightly larger than *Phryxæ pecosensis*.

Distribution.—Europe, extending to middle Sweden in the north; Maine 7, New Hampshire 3, Massachusetts 25, Connecticut 1, Rhode Island 3, New Jersey 1, Washington 1, British Columbia 1. In this case it is difficult to assign much value to published records without an examination of the material involved, or unless the host is mentioned. New York may be included here, but it is considered that many of the other published records involve material of *Phryxæ pecosensis*.

Hosts.—*Pieris rapae* (Linnaeus) 127, *Porthetria dispar* (Linnaeus) 1, *Evergestis straminealis* (Hübner) 1. Only *Pieris rapae* of Schaffner and Griswold's list belongs here. The recorded and published European host list is a long and extensive one. Howard and Fiske

record rearing *Phryxæ (Blepharidea) vulgaris* from Europe—collected *Nygmia phaeorrhoea* (Donovan). Osten Sacken records the type specimen of *hirsuta* from *Pieris rapae* (Lintner). Williston records rearing *hirsuta* from *P. rapae*.

Remarks.—The description is based on an examination of 129 reared specimens recorded above bearing Gypsy Moth Laboratory note numbers; 3 collected specimens (Dyar, Townsend, Baker); 5 male and 5 female European specimens determined by Bezzi, Brunetti, and Brauer and Bergenstamm; and an indefinite number of European specimens.

Baer states that *Phryxæ vulgaris* deposits banana-shaped eggs on the host that are ready to hatch (Pantel's group 6). Townsend records that "females of the *Phryxæ* group deposit their maggots in choria on the host." Lundbeck places *P. vulgaris* in Pantel's group 6, "ovoviviparous species depositing on the skin of the host." Adults, May to October; number per host, one, occasionally several; generations, two or more; hibernation, as larva in the host.

2. PHRYXE PECOSENSIS (Townsend)

(?) *Exorista hirsuta* Osten Sacken, TOWNSEND, *Psyche*, vol. 6, p. 467, 1893.

Exorista vulgaris (Fallen) COQUILLET (partim), U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 93, 1897.

Exorista vulgaris of authors (nec Fallen) TOTHILL, *Can. Ent.*, vol. 45, p. 71, 1913.—REGAN, *Montana Agr. Exp. Stat. Bull.* 154, p. 53, 1923.

Zenillia vulgaris (Fallen) ALDRICH and WEBBER (partim), *Proc. U. S. Nat. Mus.*, vol. 63, art. 17, pp. 26-28, 1924.—JOHNSON (partim), *List of New England Diptera*, p. 196, 1925.—ESSIG (partim), *Insects of western North America*, p. 581, 1926.—WEST (partim), *Cornell Univ. Agr. Exp. Stat. Mem.* 101, p. 814, 1928.—SCHAFFNER and GRISWOLD (partim), U. S. Dept. Agr. Misc. Publ. 188, p. 113, 1934.

Plagiophryxæ pecosensis TOWNSEND, *Insecutor Inscitiae Menstruus*, vol. 14, p. 33, 1926; *Manual of myiology*, pt. 4, pp. 225-226, 1936.—ALDRICH, *Bull. Brooklyn Ent. Soc.*, vol. 22, p. 24, 1927.

In 1927 Aldrich considered *Plagiophryxæ pecosensis* Townsend a synonym of *Zenillia vulgaris* (Fallen) from Townsend's description. Later unpublished notes by Aldrich indicate that Townsend, when on a visit to the National Museum, synonymized *Plagiophryxæ* with *Phryxæ*.

Townsend's description of *Plagiophryxæ pecosensis* adequately characterizes this species.

The recognition of *pecosensis* goes a long way toward reducing the confusion that previously existed concerning the real identity of *Phryxæ vulgaris* in North America. The writer has noticed that in many Palearctic and Nearctic species considered by specialists to be Holarctic in their distribution and morphologically inseparable there are eventually discovered small differences that serve to keep their

identities separate. This indicates a common origin of these species that have been separated by geographical barriers for a sufficient length of time to be differentiated by small morphological characters, differences in biology, and host preferences. These individual peculiarities are maintained even when the forms are brought together in the same habitat either by artificial or other means of dissemination. *P. vulgaris* and *P. pecosensis* are examples of this. Several others will be cited in this paper. *P. vulgaris* apparently accompanied *Pieris rapae* in its spread to the Nearctic realm, whereas *P. pecosensis* is a Nearctic species.

Townsend published a good description of the species. A few of the minor differences from *vulgaris* that this latest study indicates are noted: A blacker, distinctly more subshining species. Head with front of male at narrowest 0.35 to 0.38 (in five specimens) and front of female 0.37 to 0.38 (in five specimens) of head width; frontal bristles exhibiting a tendency to be fewer in number than in *vulgaris*, but there is no clear-cut demarcation, usually only two reclinate upper frontals (prevertical bristles); facial ridge bristly on lower one-half to two-fifths; antenna black, third segment in male four times or slightly more and in female nearly three times as long as second segment; arista thickened on basal half, penultimate joint elongate; palpus usually black, varying to brownish black.

Thorax black, subshining; when held at the same angle and in a more or less upright position in which the mesonotal vittae of *vulgaris* behind the suture are easily seen, the mesonotal vittae of *pecosensis* are not visible.

Sides of second abdominal segment in male reddish and in female usually black or only slightly red.

Length 7-9 mm. On the average this species is slightly smaller than *Phryxe vulgaris*.

Type locality.—Pecos National Forest, N. Mex.

Distribution.—Maine 2, New Hampshire 8, Vermont 5, Massachusetts 11, New York 5, Montana 2, Idaho 2, California 1, Washington 1, British Columbia 1. Published records: Quebec, several places (Tothill); New Brunswick (Squires); and Illinois (Forbes). There exist additional doubtful records that can be confirmed only from an examination of the specimens involved. Essig's record probably refers to the specimens listed above under Idaho and Washington.

Hosts.—*Erannis tiliaria* (Harris) 56, *Archips cerasivorana* (Fitch) 15, *Ennomos subsignarius* (Hübner) 6, *Cirphis unipuncta* (Haworth) 4, *Cingilia catenaria* (Drury) 3, lepidopterous pupa 3, *Danaus plexippus* (Linnaeus) 2, unidentified noctuid 2, *Archips argyrospila*

(Walker) 2, *Archips infumatana* (Zeller) 1, *Alsophila pometaria* (Harris) 1, *Graptolitha antennata* (Walker) 1, *Hemileuca maia* (Drury) or *H. lucina* Henry Edwards 1. Except for *Pieris rapae* (Linnaeus), Schaffner and Griswold's list of *Zenillia vulgaris* (complex) hosts all refer to *Phryxæ pecosensis*. Recorded as *P. vulgaris* records, but considered by the author to be probably *P. pecosensis* records: *Archips fumiferana* (Clemens) (Tothill, Johnson, Essig), *Synclora rubrifrontaria* Packard (Schaffner and Griswold), *Nepheleodes emmedonia* (Cramer) (Squires, Aldrich notes as *vulgaris*), *Pyrausta penitalis* (Grote) (Forbes, questionable, as Townsend determined it as *hirsuta*). Essig's record of *C. unipuncta* most probably refers to *P. pecosensis*. It is possible that Tothill's record of *Archips fumiferana* should be referred to *Aplomya caesar* (Aldrich) instead of to *P. pecosensis*.

Remarks.—The description is based on 96 reared specimens recorded above bearing Gypsy Moth Laboratory note numbers; 1 male ex *Archips argyrospila* (Walker) (Regan); and 27 males and 19 females collected in various places by Townsend, Aldrich, Morrison, Riley, Currie, and Caudell.

Regan indicates that the larva leaves the host pupa when ready to pupate. Adults, May to October; number per host, one, occasionally several; generations, two or more; hibernation, as larva in the host.

3. Genus CARCELIA Robineau-Desvoidy

- Carcelia* ROBINSON-DESVOIDY, Mém. Acad. Sci. Inst. France, vol. 2, p. 176, 1830; Histoire naturelle des diptères des environs de Paris, vol. 1, p. 220, 1863. —COQUILLET, Proc. U. S. Nat. Mus., vol. 37, p. 518, 1910.—VILENEUVE, Feuille Jeun. Nat., Ser. 5, vol. 42, p. 90, 1912.—BARANOFF, Institut für Hygiene und Schule für Volksgesundheit, Zagreb, Arb. parasit. Abt. 3, 1931; Trans. Roy. Ent. Soc., vol. 82, pp. 387–408, 1934.—TOWNSEND, Manual of Myiology, pt. 4, p. 209, 1936. (Genotype, *Carcelia bombylans* Robineau-Desvoidy. By designation of Coquillett 1910 in synonymy.)
- Senometopia* MACQUART, Mém. Soc. Sci. Lille, p. 296, 1883.—TOWNSEND, Manual of myiology, pt. 4, p. 210, 1936. (Genotype, *Tachina excisa*. By designation of Townsend.)
- Stenomctopia* Macquart, AGASSIZ, Nomenclatoris zoologicis index universalis, pp. 338, 351, 1846.
- Chetoliga* RONDANI, Dipterologiae Italicae prodromus, vol. 1, p. 66, 1856.—TOWNSEND, Manual of myiology, pt. 4, pp. 273, 284, 1936. (Genotype, *Tachina gnava* Meigen. Monotypic 1856.)
- Chetolyga* RONDANI, Dipterologiae Italicae prodromus, vol. 3, p. 93, 1859.
- Chaetolyga* Rondani, SCUDDER, Nomenclator zoologicus, Supplement List, p. 66, 1882.
- Paracxorista* BRAUER and BERGENSTAMM, Denkschr. Akad. Wiss. Wien, math. nat. Kl., vol. 56, p. 87, 1889.—TOWNSEND, Manual of myiology, pt. 4, pp. 210, 285, 1936. (Genotype, *Exorista echloniae* Rondani. Monotypic example; Brauer and Bergenstamm 1889.)

- Parexorista* BRAUER and BERGENSTAMM, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 56, p. 161, 1889.—BARANOFF, Trans. Roy. Ent. Soc., vol. 82, pp. 387-403, 1934.
- Sisyropa* BRAUER and BERGENSTAMM (partim), Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 58, p. 344, 1891.
- Exorista* of COQUILLET (nec Meigen), partim, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 91, 1897.
- Zenillia* of ALDRICH and WEBBER (nec Robineau-Desvoidy), partim, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 7, 1924.
- Senexorista* TOWNSEND, Supplementa entomologica, No. 16, p. 63, 1927.—BARANOFF, Trans. Roy. Ent. Soc., vol. 82, p. 404, 1934. (Genotype, *S. sumatrana* Townsend. By original designation.)
- Eucarcelia* BARANOFF, Trans. Roy. Ent. Soc., vol. 82, p. 393, 1934. (Genotype, *Tachina excisa* Fallen. By original designation.) (New synonymy.)
- Oecorista* TOWNSEND (partim), Manual of Myiology, pt. 4, pp. 206-207, 209-212, 1936. (New synonymy.)

The customary procedure has been to accept *Tachina gnava* Meigen (= *Carcelia bombylans* Robineau-Desvoidy) as the genotype. In 1912 Villeneuve separated *C. bombylans* and *C. gnava* as two distinct species, and at the same time he indicated that *gnava* of Macquart (nec Meigen) = *bombylans*. Stein disagreed with Villeneuve and again synonymized the two forms. Townsend considers the two species to be synonymous. By further study the two species *gnava* and *bombylans* have been definitely separated, which confirms Villeneuve's disposition of the two species. *Carcelia bombylans* Robineau-Desvoidy, an included species, must be accepted as the genotype. The issue is complicated further by a third species (numerous specimens reared from *Dasychira pudibunda* (Linnaeus) and one specimen from *Orgyia gonostigma* (Fabricius) in the *gnava* complex which has been placed in the so-called *bombylans* group, but in most characteristics it more closely approximates the species *gnava*). This third species is *Carcelia rasa* Macquart (= *amphion* Robineau-Desvoidy) (= *angusta* Brauer and Bergenstamm). Its relationship with *Carcelia bombylans* remains to be settled by comparison with the type, using our present-day conception of what constitute specific characters in the genus *Carcelia*. This does not invalidate the acceptance of *bombylans* as the genotype.

Baranoff, using Townsend in part, has divided the genus *Carcelia* for the Palearctic and Oriental realms into 15 genera. He recognized 3 genera [*Euryclea* Rondani (= *Plematomyia* Brauer and Bergenstamm), *Isocarcelia* Villeneuve, and *Tricarcelia* Baranoff] as being peculiar to the Palearctic species, 9 genera [*Catacarcelia* Townsend, *Myrocarcelia* Baranoff, *Carceliella* Baranoff, *Eocarcelia* Townsend (= *Eocarceliopsis* Townsend), *Microcarcelia* Baranoff, *Zygocarcelia* Townsend, *Carceliopsis* Townsend, *Isocarceliopsis* Baranoff, and *Asiocarcelia* Baranoff] for the Oriental species, and 3 genera [*Car-*

celia Robineau-Desvoidy, *Paræxorista* Brauer and Bergenstamm (= *Senæxorista* Townsend), and (*Eucarcelia* Baranoff) = *Senometopia* Macquart sensu Townsend} as being applicable to both realms. As the writer is impressed by the close resemblance of some of the species of the Nearctic and Palearctic regions, the probable value of the Palearctic genera *Tricarcelia*, *Senometopia*, *Carcelia*, *Paræxorista*, *Euryclea*, and *Isocarcelia* should be considered. To apply Baranoff's table beyond *Tricarcelia*, *Carcelia amplexa* with its variable characters of three or four dorsocentral macrochaetae, inner ventral bristle of the midtibia weak or wanting, and with or without discal macrochaetae, would cause considerable trouble with the proposed classification. After the division made on the absence or presence of an inner ventral bristle on the midtibia, the main subdivisions of the classification are based on male characters later reverting to female characters to establish the validity of the genera (*Pelmatomyia*) = *Euryclea* and *Isocarcelia*. It is a doubtful procedure to recognize genera established on sexual characters only, and it is the writer's opinion that *Euryclea* and *Isocarcelia* should not be given even subgeneric recognition. In (*Eucarcelia*) = *Senometopia* with the hind coxa without small bristles behind at the apex, the abdomen may be with or without discal macrochaetae; while in the alternative bracket with the hind coxa with small bristles behind at the apex, the classification is divided into *Carcelia* without discal macrochaetae and *Paræxorista* with discal macrochaetae.

Apparently Baranoff's restricted genera utilized in his treatment of the *Carcelia* complex were not available in time for incorporation in Townsend's Manual of Myiology. Townsend places his genera concerned in three different tribes. Townsend's designation of *Carcelia laxifrons* Villeneuve as the genotype of *Paræxorista* cannot be accepted, as *Exorista cheloniae* Rondani was the monotypic example when Brauer and Bergenstamm proposed the genus *Paræxorista*.

The Palearctic concepts of the genus *Carcelia* are fairly well agreed upon. Nearly everyone has accepted Villeneuve's idea of the genus that it forms a natural group. The accepted disposition has been to place all "*Exorista*" (s. l.) species having two sternopleural macrochaetae and hind tibiae ciliate in this genus. The more pertinent and diagnostic characters of eye high and jowl or gena linear have not been given the prominence they deserve. The last-mentioned characters have been used in this paper to place the genus *Carcelia* on a stronger systematic basis. It has been necessary to broaden the concepts of the genus to allow for the inclusion of forms having three sternopleural macrochaetae. Aldrich and Webber distributed their species of *Carcelia* among three of their subgenera; their subgenus *Paræxorista* is too broad to be usable. Some European authorities

consider *Carcelia* in most respects to be similar to *Winthemia*. While I admit a strong systematic relationship, it is doubtful if *Carcelia* and *Winthemia* are as closely related biologically as perhaps *Sisyropa* and *Winthemia*. In the Nearctic realm *Carcelia* is biologically related to *Gymnocarcelia*, genotype *ricinorum* Townsend, a bare-eyed species with *Carcelia*-like characters that has been removed from *Sturmia*. Townsend places *Carcelia* and *Gymnocarcelia* in the tribe Carceliini and the genus *Winthemia* in the tribe Sturmiini.

In a restricted sense the Nearctic species belong to the subgenera *Carcelia* and *Paraexorista*, but the lines of demarcation between the two genera as previously defined are clearly lacking. The following treatment is suggested for those workers who prefer or insist on restricted genera or a definition of species groups:

1. *formosa, inflatipalpis, lagoae.*
2. *diacrisiae, amplexa, perplexa, olencensis, yalensis.*
3. *reclinata (Paraexorista).*
4. *malacosomae, laxifrons, protuberans.*
5. *flavirostris.*
6. *gnava (Chetoliga).*
7. *separata (Senometopia).*

The combination of groups 1 and 2 equals Townsend's concepts of *Oxexorista*. The combination of groups 3 and 4 equals the previous concept of *Paraexorista*. The recognition of *Chetoliga* would be dependent upon dividing *Carcelia* (s. s.) into a *gnava* group and a *bombylans* group. As no useful taxonomic or bionomic result can be achieved at this time by carrying out such a program, the genus *Carcelia* is retained as proposed.

The oviposition habits of the genus *Carcelia* should be discussed to demonstrate its biological unity. Lundbeck states that "*gnava* and *cheloniae* belong to Pantel's group 10 as characterized by pedunculate eggs, and the same no doubt holds good for the other species" of *Carcelia*. Brown mentions that the eggs of *gnava* are laid on the ends of the hairs of the hosts. Townsend describes the eggs of *Paraexorista* and *Oxexorista* as being of the elongate, cylindrical, pedunculate type. The females of *formosa, amplexa, laxifrons, malacosomae, separata, rasa,* and *cheloniae* (if not confused with *laxifrons* or the so-called "*cheloniae*" in American literature) all deposit elongate, cylindrical, pedunculate eggs that are attached either to the hairs of the host or fastened to the body. *C. gnava*, which has been much confused with *separata* in literature, has a strange and most interesting habit of projecting its eggs or larvae through the air successfully for a distance from one-half the length of the body of the adult up to at least one-half inch. In agreement with Lundbeck, the writer believes that the eggs of the other species of this group will be of the elongate, cylindrical, pedunculate type.

Most of the species of *Carcelia* possess an inner ventral bristle on the midtibia and small bristly hairs behind at apex of hind coxa. *Carcelia separata* lacks both these characters. In a few species there is exhibited a tendency to the lack of an inner ventral bristle to become a secondary sexual character. Except for *C. separata*, all the other species treated in the following key have the hind coxa with small bristly hairs behind at the apex.

KEY TO THE SPECIES OF CARCELIA

There are 15 species included in the key, 12 of which are known to occur in the Nearctic realm and one in the Neotropical realm. As the Palearctic species *Carcelia separata* and *C. gnava* have been released in the northeastern part of the United States, they are included, but to date there is no evidence to indicate that they are established. It was considered that the systematic value of the table would be increased even if *separata* and *gnava* are never recovered in North America; it will also help to keep the identity of the two species separate in our literature. The Palearctic species of this group are so similar to many Nearctic species that much confusion in their identity has arisen. Sufficient Palearctic material has been examined to place the knowledge of the Nearctic species of *Carcelia* on a firm basis.

1. Midtibia with one median anterolateral bristle; fore tibia with one or two median posterolateral bristles..... 7
 Midtibia with two or more median anterolateral bristles; fore tibia with two median posterolateral bristles..... 2
2. Sternopleural macrochaetae two..... 4
 Sternopleural macrochaetae three..... 3
3. Palpus normal and flat; no discal bristles on second and third abdominal segments..... 1. *formosa* (Aldrich and Webber) (p. 43)
 Palpus swollen; small or weak discal bristles on second and third abdominal segments..... 2. *inflatipalpis* (Aldrich and Webber) (p. 45)
4. Discal bristles or macrochaetae on second and third abdominal segments... 5
 No discal bristles or macrochaetae on second and third abdominal segments..... 3. *gnava* (Meigen) (p. 45)
5. Frontal bristles on parafacial not nearer to facial ridge than to margin of eye, descending to at least on a level with insertion of arista; facial ridge usually bristly on more than lowest one-fourth, often ascending to near middle especially in males; more or less developed discal bristles or macrochaetae on second and third abdominal segments, more or less irregularly arranged; when viewed from behind inner forceps of hypopygium closely approximated..... 6
 Frontal bristles on parafacial nearer facial ridge than margin of eye, descending to at least on a level with base of third antennal joint; facial ridge usually bristly on lowest one-fourth, sometimes ascending slightly higher in males; discal bristles on second and third segment approach weak macrochaetae in size (usually one pair of weak discal macrochaetae on third segment); when viewed from behind inner forceps of hypopygium widely separated..... 4. *reclinata* (Aldrich and Webber) (p. 48)

6. Front and face silvery-gray pollinose; parafacial bearing usually several easily discernible hairs on upper side below frontal bristles, these hairs rarely absent; thorax light brown on sides and black on dorsum; femora light brown, concolorous with tibiae, and about same color as sides of thorax; midtibia with one anterolateral bristle about the middle with one or more above, with usually none below but when present small.

Abdomen, including dorsal shoulders of first segment and hind margins of second and third segments, covered with gray pollen without sheen; abdominal vitta obscure and not clearly marked, especially on third segment when held in a light that does not allow reflection of pollen to vary on either side; sides of male abdomen more or less broadly and distinctly rufous. A lighter, more brownish form than *Carectia laxifrons*, the gray pollen often mixed with a brownish tinge

5. *malacosomae*, new species (p. 50)

Abdomen mostly yellow, with a narrow black vitta on dorsum. A lighter, more yellowish form than *Carectia malacosomae* (male only)

6. *protuberans* (Aldrich and Webber) (p. 54)

Front and face silvery-gray pollinose, with a smoky tinge; parafacial usually bare on upper side below frontal bristles, when present hairs one or two in number are smaller, not so distinctive, and difficult to locate without aid of higher powers of binocular; thorax black on sides and dorsum; femora black contrasting with brown tibia, mid-tibia with one anterolateral bristle about middle with one or more smaller above, and usually one below sometimes quite long; hind tibia appearing to be more subciliate but not distinctly so; abdomen covered with gray pollen, dorsal shoulders of first segment thinly pollinose, very narrow apical margins of second and third segments black; abdominal vitta clearly marked or defined especially on third segment, when held in a light that does not allow reflection of pollen to vary on either side; sides of male abdomen blacker, only obscurely rufous on intermediate segments. A blacker form----- 7. *laxifrons* Villeneuve (p. 54)

7. Front tibia with two median posterolateral bristles; legs never wholly black----- 11

Front tibia with one median posterolateral bristle----- 8

8. Median inner ventral bristle on midtibia present----- 9

Median inner ventral bristle on midtibia lacking

8. *separata* (Rondani) (p. 56)

9. Two sternopleural macrochaetae, legs black----- 10

Three sternopleural macrochaetae----- 9. *lagoae* (Townsend) (p. 58)

10. Row of discal macrochaetae on fourth segment

10. *flavirostris* (Van der Wulp) (p. 60)

No discal macrochaetae, legs wholly black

11. *diacrisiae*, new species (p. 61)

11. Femora black and tibia brown or yellow, not concolorous----- 12

Femora and tibia yellow, concolorous----- 12. *amplexa* (Coquillett) (p. 63)

12. Abdomen reddish yellow on sides; male usually with one reclinate upper frontal bristle and two reclinate prevertical bristles; female with one pair of marginal macrochaetae on second abdominal segment; male and female with one strong inner ventral bristle on midtibia, longer than and situated higher on tibia toward femur than the lower of the two median posterolateral bristles----- 13. *perplexa*, new species (p. 65)

Abdomen predominantly black with reddish-yellow areas on sides in male, female black but sometimes reddish yellow; male with only two reclinate

prevertical bristles, abdomen with long fine hairs on discal portions of second and third segments, inner ventral bristle on midtibia small, weak or lacking; female with one pair of marginal macrochaetae on second abdominal segment, inner ventral bristle on midtibia about same size as the lower of the two posterolateral bristles; pollen of thorax and abdomen with a bluish tinge..... 14. *olenesis*, new species (p. 67)

Abdomen black; male with two reclinate prevertical bristles; female with two pairs of marginal macrochaetae on second segment of abdomen; male and female with one strong inner ventral bristle on midtibia

15. *yalensis*, new species (p. 69)

1. *CARCELIA FORMOSA* (Aldrich and Webber), new combination

Exorista eudryae of COQUILLET (nec Townsend) (partim), U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, pp. 13-14, 1897.

Oxeorista eudryae (Townsend), 1912 nec 1892, Proc. Ent. Soc. Washington, vol. 14, p. 165. (New synonymy.)

Oxeorista thompsoni TOWNSEND (partim), Proc. Biol. Soc. Washington, vol. 28, p. 21, 1915; Manual of myiology, pt. 4, p. 211, 1936. (New synonymy.)

Zenillia formosa ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 23-24, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.—SCHAEFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 112, 1934.

Oxeorista formosa (Aldrich and Webber) TOWNSEND, Manual of myiology, pt. 4, p. 212, 1936.

The female paratype of *formosa* bearing the notation TD395 clears up Townsend's concept of *Oxeorista thompsoni* even if the name cannot be utilized. Although Townsend visualized the specimen TD395 when he proposed the new species *thompsoni*, he selected as the type a specimen that has proved to be *Sisyropa eudryae* Townsend. This is discussed in more detail under the genus *Sisyropa*.

Head with front of male at narrowest 0.22 to 0.23 (in six specimens) and in female 0.25 to 0.28 (in six specimens) of head width; frontal row of seven to eight bristles in male and five to seven in female, extending from base of third antennal segment to the two reclinate upper frontals (preverticals); facial ridge bristly on lowest one-fifth; gena one-fifteenth or less eye height; frontal orbit, face, cheek, and posterior orbit silvery-white pollinose; antenna black, first and second segments usually faintly reddish in female, third segment of male nearly four times and in female at least three times length of second; arista thickened on basal one-fourth to one-third, gradually tapering to apex, penultimate segment short; palpus yellow, flat, not swollen, clothed with fine black hairs some of which are present on apical portion.

Thorax black covered with silvery-gray pollen, marked by five black mesonotal vittae; four postsutural dorsocentral macrochaetae; scutellum yellowish, well covered with gray pollen, three pairs of marginal scutellars and one strong decussate apical pair turned backward, disk

covered with erect hairs and bearing one pair of discal scutellars; three sternopleural macrochaetae; legs black; fore tibia with two median posterolateral bristles, midtibia bearing two or more median anterolateral bristles, one strong median inner ventral bristle; hind tibia evenly ciliate, with one longer median bristle; wing grayish hyaline, third vein with one or two bristles at base; squamae white.

Abdomen black covered with gray pollen except dorsum of first segment, which is shining black, apex of fourth segment and apical portions of segments 2 and 3 less pollinose and often blackish or subshining; the usual shining-black dorsal vitta obscure except on basal half of second segment; sides of second segment of males usually slightly rufous; no discal macrochaetae; first and second segments with a pair and third with a row of marginal macrochaetae; fourth covered with erect bristles more or less irregularly placed, about one-half size of macrochaetae on third segment; abdominal hairs of female subdepressed, in male more erect.

Length 9-12 mm.

Type locality.—West Medford, Mass.

Distribution.—Massachusetts 3, New York 4, New Jersey 3, Pennsylvania 1, District of Columbia 1, Virginia 1, Indiana 1, Missouri 1. Additional published records not duplicated above: Connecticut (Johnson), New York 4 (West), New Jersey (Weiss), Maryland 2 (Aldrich and Webber), New Mexico (Aldrich and Webber).

Type.—Male, U.S.N.M. No. 25705.

Hosts.—*Automeris io* (Fabricius) 21; *Agrotis ypsilon* (Rottemberg) 4; *Graptolitha innominata* (Smith) or *disposita* (Morrison) 1. Published record not duplicated in the above material: *Automeris io* (Fabricius) (Reinhard). Coquillett's record of rearing *Exorista cudryae* from *Acrionicta hamamelis* Guénée (Koebele) belongs here; Townsend's description of the anal stigmata was drawn from a puparium on the same pin with fly labeled "389 Lo, Aug. 8, 82."

Remarks.—The foregoing description is based on male type and male paratype, reared from *Automeris io*, West Medford, Mass. (Riley; Coquillett records as *Exorista cudryae*); two male and two female paratypes reared from *Agrotis ypsilon*, Missouri (Riley; Coquillett records as *Exorista cudryae*); one female paratype, Lafayette, Ind. (Aldrich); one female paratype, Melrose, Mass., TD 395, (Townsend); one male paratype, Lehigh Gap, Pa. (Greene); 22 reared specimens bearing Gypsy Moth Laboratory note numbers, all but one reared from *A. io*; one male and two females collected by Aldrich, Greene, and Walton.

Adults, May to September; number per host, one to eight; generations, one; hibernation, as larvae in host pupa.

2. *CARCELIA INFLATIPALPIS* (Aldrich and Webber), new combination

Zenillia inflatipalpis ALDRICH AND WEBBER, PROC. U. S. NAT. MUS., vol. 63, art. 17, pp. 24-25, 1924.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.

This species resembles *Carcelia formosa* very closely, and in many of their characteristics they are identical. The principal points of difference are: Palpus swollen, apical portion destitute of fine black hairs with which the remainder of the palpus is sparsely clothed; a less pollinose, slightly more subshining species; erect discal bristles on second and third abdominal segments, which are distinctly larger and longer than the surrounding subdepressed abdominal hairs. Females of *C. formosa* have a very few weak, erect hairs in the discal region, but they are the same size as the surrounding subdepressed abdominal hairs.

The following characters are perhaps worth mentioning, otherwise the description is the same as for *formosa*: Head with front of female at narrowest 0.27 head width; frontal orbit, face, cheek, and posterior orbit silvery pollinose; antenna black, first and second joints not faintly reddish, third antennal segment two and one-half to three times length of second; arista tapering from base to apex.

Abdomen black, gray-pollinose, heavy pollen more confined to sides and bases of segments; dorsum of first segment and apical portion of other segments more or less shining black; no distinct abdominal dorsal vitta; in type specimen erect bristles in discal regions of second and third abdominal segments almost approaching small macrochaetae in size, this character not so pronounced in other specimens, but the erect bristles are larger and stronger than surrounding subdepressed abdominal hairs.

Length 9 to 10 mm.

Type locality.—Great Falls, Va.

Distribution.—Virginia 1, Indiana 1. Published record: New York (West).

Type.—Female, U.S.N.M. No. 25706.

Host.—Unknown.

Remarks.—The foregoing statements are based on the examination of the type, June 12 (Banks); the female paratype, Lafayette, Ind., September 14, 1917 (Aldrich); two females, Great Falls, Va., August 14, 1919 (Greene). The last two females were removed from the *Carcelia formosa* material where they were with a female of *C. formosa* (Greene) having the same date and locality.

3. *CARCELIA GNAVA* (Meigen)

This species closely resembles the genotype *Carcelia bombylans* Robineau-Desvoidy. For many years *C. gnava* of Macquart (nec Meigen) was accepted as the genotype. The complete Palearctic

synonymy is not given; sufficient is included to indicate the history of the species. For a more complete record, the reader is referred to Bezzi and Stein and to Lundbeck.

Tachina gnara MEIGEN, Systematische Beschreibung der Europäischen zweiflügeligen Insecten, vol. 4, pp. 156, 330, 1824.

Chetoliya gnara (Meigen) RONDANI, Dipterologiae Italicae prodromus, vol. 1, p. 66, 1856.

Carecia gnara (Meigen) BEZZI and STEIN, Katalog der paläarktischen Dipteren, vol. 3, p. 236, 1907.—COQUILLETT, Proc. U. S. Nat. Mus., vol. 37, p. 518, 1910.—VILLENUEVE, Feuille Jeun. Nat., ser. 5, vol. 42, p. 90, 1912.—ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 7, 1924.—LUNDBECK, Diptera Danica, pt. 7, p. 377, 1927.—BURGESS and CROSSMAN, U. S. Dept. Agr. Tech. Bull. 86, pp. 114-115, 1929.—BARANOFF, Institut für Hygiene und Schule für Volksgesundheit, Zagreb, Arb. parasit. Abt., No. 3, 1931.—BROWN, U. S. Dept. Agr. Circ. 176, pp. 13-14, 1931.

Carecia proccessionae (Ratzeburg) STEIN, Arch. Naturg. Abt. A. Heft. 6, p. 66, 1924.

Carecia bombylans of TOWNSEND (nec Robineau-Desvoidy), Manual of myiology, pt. 4, pp. 213-214, 1936.

Head with front of male at narrowest 0.21 to 0.22 (in three specimens) and in female 0.24 to 0.26 (in three specimens) of head width; frontal row of nine or ten bristles in male and seven to nine in female, extending from almost the end of second antennal segment to two reclinate upper frontals (preverticals); facial ridge bristly on lowest one-fourth; gena one-sixteenth or less eye height; frontal orbit grayish silvery white, face and posterior orbit silvery white, gena silvery gray; antenna black, third antennal segment of male three times and in female nearly three times as long as second; arista thickened on basal half, penultimate segment short; palpus yellow.

Thorax blackish, bluish-gray pruinose, marked by five black mesonotal vittae; four postsutural dorsocentral macrochaetae; scutellum yellow, three pairs of marginal scutellars and one decussate apical pair turned backward, one pair of discal scutellars; two sternopleural macrochaetae; legs black, tibiae yellowish brown; fore tibia with two median posterolateral bristles; midtibia bearing two or more median anterolateral bristles, one inner ventral bristle; hind tibia more or less evenly ciliate, with one longer median bristle; wing grayish hyaline, third vein with two or three bristles at base.

Abdomen black covered with gray pollen except dorsum of first segment, narrow apical margins of other segments, and narrow dorsal vitta which are shining black; in male sides of segments 1, 2, and 3 broadly yellowish red, in female usually black; no discal macrochaetae; first and second segments usually with two pairs (sometimes three on second segment in male) of marginal macrochaetae,

sometimes one pair either weak or lacking; third segment with a marginal row; fourth covered with erect bristles hardly if at all longer than abdominal hairs of segments 2 and 3.

Length 8 to 10 mm.

Distribution.—Widely distributed throughout Europe. This species has been liberated in the northeastern part of the United States; as yet it has not been recovered.

Hosts.—*Stilpnotia salicis* (Linnaeus) (principal host, sometimes reaching a 35-percent parasitization), *Dasychira pudibunda* (Linnaeus) (overwintering host), *Malacosoma neustria* (Linnaeus) and *Porthetria dispar* (Linnaeus) (records from the Bureau's former Central European Parasite Laboratory, Budapest, Hungary). Published records: Baer and Lundbeck mention *Orgyia antiqua* (Linnaeus) and *Arctia caja* (Linnaeus). *P. dispar* is a very rare and only an accidental host; the *Carcelia* recovered from *dispar* is usually *separata* (Rondani). Howard and Fiske were discussing *C. separata* instead of *C. gnava*.

Remarks.—Description based upon an examination of 25 to 30 specimens from central Europe.

Adults, May to August; number per host, one to several; generations, two; hibernation, as larva in host larva; copulation time, 15 minutes.

The manner in which this species oviposits is a very interesting one. It has the habit of projecting its eggs or larvae through the air for a distance from one-half the length of the body of the adult up to at least one-half inch. It is not necessary for the female to come in contact with the host hairs, and the females can oviposit when the host larvae are crawling rapidly away from or past them. It was never determined whether the larva leaves the egg after it contacts the host hairs, whether the eggshell is ruptured at the time of ejection, or whether the larva is ejected through the air with the eggshell attached. Many attempts were made to determine this peculiarity, but by the time the attacked larva was placed under the binocular, the parasite larva was always found crawling down the host hair; in every case the collapsed empty eggshell of the cylindrical, elongate type was found attached to a host hair somewhere near the outer extremity. It is believed that the egg is ruptured when ejected from the ovipositor, and that the larva passes through the air either partly emerged or with the eggshell attached.

In 1930 a small shipment of about 136 puparia of *Carcelia* that were described as *gnava* reared from *Dasychira pudibunda* was sent to the Gypsy Moth Laboratory from Budapest, Hungary. A total of 80 adults were subsequently secured from these puparia. The species

proved to be *Carcelia rasa* Macquart (= *Sisyropa angusta* Brauer and Bergenstamm). This species belongs to the *bombylans* group which is distinguished by having only one median anterolateral bristle on the midtibia. It differs from *C. gnava* as follows: Head with front of male at narrowest 0.17 to 0.18 (in three specimens) and of female 0.20 (in three specimens) of head width; 13 to 15 frontal bristles in male and 7 to 11 in female which descend to even with arista; gena one-twentieth eye height; arista thickened on basal two-fifths.

Thorax more thinly pollinose, so that it is difficult to see the median mesonotal vitta; yellow color of male and female scutellum extending on to posterior portion of scutum.

Abdominal hairs of male about as long as macrochaetae, which causes marginals of second and third segments to appear more or less indistinct; usually only one pair of marginals on first abdominal segment.

This species has not been liberated in North America.

4. CARCELIA RECLINATA (Aldrich and Webber), new combination

Zenillia reclinata ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 32-33, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925.—ESSIG, Insects of western North America, p. 581, 1926.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.—SCHAFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, pp. 112-113, 1934.

Zenillia eudryae of ALDRICH (nec Townsend), Proc. U. S. Nat. Mus., vol. 80, art. 20, p. 2, 1932.

Paraexorista reclinata (Aldrich and Webber) TOWNSEND, Manual of myiology, pt. 4, p. 211, 1936.

Carcelia reclinata is almost identical in appearance with the Palearctic species *Carcelia cheloniae* Rondani. The adults and puparia of both species can be separated. It is surprising that the name *C. cheloniae* was used to cover the material represented by *Carcelia malacosomae*, new species, and the introduced species *Carcelia laxifrons*, which are as easily separated from *C. cheloniae* as from *C. reclinata*.

Head with front of male at narrowest 0.20 to 0.24 (in five specimens) and of female 0.26 to 0.30 (in five specimens) of head width; frontal row of 11 or 12 bristles in male and 6 to 8 in female, extending from a little below base of third antennal segment to 2 reclinate upper frontals (preverticals); facial ridge bristly on about lowest one-fourth, sometimes ascending higher in males; gena one-twelfth or less eye height; frontal orbits silvery gray pollinose, gradually becoming blacker toward vertex, especially so in female; face, gena, and posterior orbit silver-gray pollinose; antenna black, third segment of male nearly four times and in female about three times length of second; arista thickened on basal one-third, penultimate segment usually a little longer than broad; palpus yellow, base infuscated.

Thorax black covered thinly with light-gray pollen marked by five black mesonotal vittae; four postsutural dorsocentral macrochaetae; scutellum testaceous covered with gray pollen, three pairs of marginal scutellars and one strong decussate apical pair turned backward, disk covered with erect hairs and bearing one pair of discal scutellars; two sternopleural macrochaetae; legs black, tibiae brownish or yellowish with base and apex inclined to be blackish on ventral side; front tibia with two median posterolateral bristles; midtibia bearing two median anterolateral bristles of about equal length, one inner ventral bristle; hind tibia ciliate, with one or two longer bristles; wing grayish hyaline, third vein usually with two bristles at base; squamae white.

Abdomen black, subshining, covered with gray pollen except dorsum of first segment, a narrow apical border on remaining segments, and an obscurely marked median dorsal vitta; gray pollen more pronounced basally and laterally on dorsum of segments; first segment with a pair, second with two pairs, and third with a row of marginal macrochaetae; discal portions of second and third segments with erect bristles, some of those on third approaching weak macrochaetae in size; fourth segment covered with erect bristles about one-half size of marginal macrochaetae on third segment; sides of first, second, and third segments rufous, females usually black but sometimes with a rufous spot on sides of second and third segments; hypopygium brownish black, inner forceps curving inwardly and tapering to a fine point (when viewed from behind distinctly separated), outer forceps stouter and decidedly shorter.

Length 7 to 10 mm.

Type and allotype localities.—Hell Canyon, Manzano National Forest, N. Mex.

Distribution.—Maine 5, New Hampshire 10, Massachusetts 9, Ontario 1, New York 2, New Jersey 2, Maryland 1, Virginia 1, North Carolina 1, Indiana 1, Texas 1, New Mexico 2, Utah 3, Arizona 1, Idaho 1, California 1. Additional published records not duplicated above: Vermont (Johnson), Rhode Island (Schaffner and Griswold), New York 2 (West).

Type.—Male, U.S.N.M. No. 25697.

Hosts.—*Estigmene acraea* (Drury) 113; *Diacrisia virginica* (Fabricius) 25; unidentified Arctiidae 8; *Phragmatobia assimilans* var. *francoia* Slosson 1.

Remarks.—The description is based on an examination of the type, allotype, two male paratypes, and one female paratype, Hell Canyon, N. Mex. (Townsend); one male and two female paratypes, Indian Spring, N. Mex. (Townsend); one female paratype, Great Falls, Va. (Townsend); two male paratypes, Tempe, Ariz. (Caffrey); one male

paratype, Tempe, Ariz. (Wildermuth); one female paratype reared from *Phragmatobia assimilans* var. *francoia*, Hymers, Ontario (Dawson); 143 reared specimens bearing Gypsy Moth Laboratory note numbers (3 males reared from *Estigmene acraea* are paratypes, Nos. 10046 C14 and E31); one male and one female reared from arctiid (Dimmock), removed from the *Sisyropa eudryae* material; one female reared from *E. acraea* Raleigh, N. C. (Brimley); seven males and one female (Aldrich, Townsend, Eddington); seven males and four females from Idaho, Utah, Texas, Arizona, and Maryland (Aldrich, Mitchell, Caffrey, Shannon), removed from the *Carcelia "cheloniae"* material. One specimen determined by Townsend as *Carcelia* was *reclinata*; this specimen has only three postsutural dorsocentral macrochaetae.

One male paratype of *Carcelia reclinata* with puparium from the Gypsy Moth Laboratory, June 16, 1916, is *C. laxifrons* Villeneuve.

The puparia of *Carcelia reclinata* and *C. cheloniae* are alike in their major characteristics. The stigmal plates are about flush with the surface of the puparium, and they are distinctly not protuberant; the stigmal slits are plain. The stigmal plates of *C. cheloniae* are far above the longitudinal axis or subdorsally located, whereas in *C. reclinata* they are almost centered, being only slightly above.

Essig records *Zenillia reclinata* as having been commonly reared from *Estigmene acraea* in New Mexico and Arizona. The material that the writer examined from Arizona and New Mexico consisted of collected specimens; none of it had been reared.

Adults, January to September (depending upon the climate); number per host, one to several; generations, two or more; hibernation, larva in host larva (the indications are that *Carcelia cheloniae* also hibernates in this manner).

5. CARCELIA MALACOSOMAE, new species

Erorista cheloniae of authors (nec Rondani).—COQUILLET, U. S. Dept. Agr. Div. Ent., Tech. Bull. 7, pp. 13, 92, 1897.—GIBSON, Ann. Rep. Ent. Soc. Ontario, 1911, p. 117.—TOTHILL, Can. Ent., vol. 45, p. 70, 1913.

Paracrorista cheloniae of authors (nec Rondani).—HOWARD and FISKE, U. S. Dept. Agr., Bur. Ent., Bull. 91, pp. 257, 286, 299-300, 1911.—TOWNSEND, Proc. Ent. Soc. Washington, vol. 18, pp. 1-19, 1916.—THORPE, Biol. Rev., Cambridge Phil. Soc., vol. 5, No. 3, pp. 193-194, 1930.

Paracrorista cheloniae of ALDRICH and WEBBER (nec Rondani).—TOWNSEND, Manual of myiology, pt. 4, p. 211, 1936.

Carcelia laxifrons of THOMPSON (nec Villeneuve), Bull. Soc. Zool. France, vol. 48, pp. 165-170, 1923.

Zenillia cheloniae of authors (nec Rondani).—ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 31-32, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925; Biological Survey of Mount Desert region, The insect fauna, pt. 1, p. 201, 1927.—ESSIG, Insects of western North America, p. 531, 1926.—BURNESS and CROSSMAN, U. S. Dept. Agr. Tech. Bull. 86, pp. 136-138, 1929.

Zenillia protuberans of SCHAFFNER and GRISWOLD (nec Aldrich and Webber), U. S. Dept. Agr. Misc. Publ. 188, p. 112, 1934.

Paraxorista protuberans of SCHAFFNER and GRISWOLD (nec Aldrich and Webber).—TOWNSEND, Manual of myiology, p. 4, p. 213, 1936.

Carecia cheloniae Rondani does not occur in the Nearctic realm. The previous use of the name as applied to the Nearctic fauna has been one of mistaken identity.

Carecia malacosomae, a Nearctic species, and *Carecia laxifrons*, an introduced and established Palearctic species, constitute a classical gem in the resemblance of species of these two realms. They have been considered morphologically inseparable by specialists of the family for the past three decades, principally under the name of *cheloniae*. The resulting confusion, coupled with the initial misidentification of the species, has provoked considerable argument and produced many interesting theories, some of which can well be dispensed with. Although the controversy is probably far from ended, it has afforded the writer considerable satisfaction in being able to clear up much of the existing confusion, and to define the status of these two species.

Head with front of male at narrowest 0.27 to 0.28 (in five specimens) and in female 0.30 to 0.33 (in five specimens) of head width; frontal row of the usual 10 to 12 bristles in the male and 6 to 8 in the female, extending from at least on a level with insertion of arista to two reclinate upper frontals (preverticals); facial ridge usually bristly on more than lowest one-fourth, often ascending to near middle, especially in males; gena one-fifteenth or less eye height; frontal orbit and face silvery gray pruinose; parafacial bearing a few discernible hairs on upper side just below frontals. these hairs rarely absent; antenna black, third segment three times second; arista thickened on basal one-fourth, penultimate segment short; palpus yellow.

Thorax varying from reddish brown on sides to black on dorsum, gray pollinose, usually marked with five discernible mesonotal vittae; four postsutural dorsocentral macrochaetae; scutellum testaceous thinly covered with pollen, three pairs of marginal scutellars and one strong decussate apical pair turned backward, disk covered with erect hairs and bearing one pair of discal scutellars; two sternopleural macrochaetae; femora and tibiae yellowish brown, tarsi black; front tibia with two posterolateral bristles; midtibia bearing two or more median anterolateral bristles, one long bristle about the middle with one or more above, with usually none below but when present very small; midtibia with one inner ventral bristle; hind tibia ciliate, with one longer bristle.

Abdomen blackish, covered, including hind margins, with gray pollen, without sheen, sides yellowish red in male, black in female;

dorsal vitta obscure and not clearly marked especially on third segment when held in a light that does not allow reflection of pollen to vary on either side; first segment with a pair, second with two pairs, and third with a row of marginal macrochaetae; discal portions of the second and third segments with strong bristles or macrochaetae that tend to blend somewhat with the erect abdominal hairs; fourth segment covered with erect bristles about one-half size of marginal macrochaetae on third segment; hypopygium brownish to black, inner and outer forceps long and of even length, former straight and parallel except at apex, where they diverge slightly (when viewed from behind they appear fused for two-thirds their length).

Length 8 to 10 mm.

The stigmal plates on the puparium are protuberant.

Type and allotype localities.—Saugus and Dedham, Mass., respectively.

Distribution.—Maine 5, New Hampshire 8, Vermont 8, Massachusetts 16, Connecticut 3, Rhode Island 2, New York 1, New Jersey 5, Alberta 1. Published records not duplicated above: New Brunswick (Tothill), Maine (Johnson), Colorado 2 (Coquillett ms., Walton ms.), British Columbia (Tothill). Coquillett records New Hampshire, Michigan, Tennessee, Georgia, and California. The material that Aldrich and Webber recorded as being from Utah, Arizona, and Maryland has been transferred to *Carcelia reclinata*.

Type.—Male, U.S.N.M. No. 54154.

Hosts.—*Malacosoma disstria* Hübner 290, *Malacosoma americana* (Fabricius) 129, *Hemileuca maia* (Drury) and *Lucina* Henry Edwards 2, *Hyphantria cunea* (Drury) 1, unidentified tenthredinid 1. Published and unpublished records not duplicated in above material: *M. disstria* (Tothill), *Datana integerrima* Grote and Robinson (Schaffner and Griswold). Owing to the confusion surrounding the previous identity of *Carcelia malacosomae*, the following published host records should be viewed with some suspicion until further evidence is assembled: *Arachnis picta* Packard (Coquillett), *Callarctia proxima* (Guérin-Méneville) (Coquillett), *Callarctia ornata* Packard (Tothill), *Archips argyrospila* (Walker) (Gill), *Turuptiana permaculata* (Packard) (Gillette). Tothill's record of *Phragmatobia assimilians* Walker probably refers to *Carcelia reclinata*.

Remarks.—The foregoing description was based on an examination of the following material (all previously determined as "*cheloniae*"): 421 specimens bearing Gypsy Moth Laboratory note numbers (including the following material reared from *Malacosoma disstria*: Type, 2 male and 1 female paratypes, No. 10001; 1 female paratype, 10001a; allotype and 1 female paratype, 10001c; 1 male paratype, 10081 J20; 1 male paratype, 11710 J1a. The following material

reared from *Malacosoma americana*: One female paratype, 10000G; 3 female paratypes, 10000i; 1 female paratype, 10070 C5; 1 male paratype, 10070 J23; 1 male paratype, 11701 J3a); and 14 field-collected specimens including 1 male and 2 female paratypes from Melrose Highlands, Mass. (Webber) and 1 male paratype from Blue Hills, Mass. (Webber).

Now that the identity is clear, the biology can be further discussed. It has been observed that this species emerges from hibernation about a week later in the spring than *Carcelia laxifrons* does. This would seem to be quite normal and natural, as the preferred hosts of *Carcelia malacosomae*, namely, *Malacosoma disstria* and *M. americana*, would have to develop from the egg to a suitable size for parasitization; whereas the preferred host of *C. laxifrons*, namely, *Nygmia phaeorrhoea*, which hibernates as a larva, would develop to a suitable size earlier. The males precede the females in emergence by a day or two and prefer to mate with the freshly emerged females. The average length of time spent in copulation is from 15 to 20 minutes. The elapsed time from copulation to commencement of oviposition is from 7 to 8 days. The egg hatches in from 45 minutes to 5 days after deposition, depending upon how far the larva has incubated at the time of oviposition. (The observation supports both Pantel's and Townsend's observation on *Carcelia cheloniae* and *C. laxifrons*.) A record of oviposition of 510 eggs was secured from an unfertilized female. The eggs are deposited anywhere on the dorsal hairs of the host and rarely on the skin. The larva hatches from the opposite end of the egg from which the pedicel is attached. After emerging from the egg, the larva continues its way down the side of the egg, along the hair upon which the egg was laid, until it reaches the body of the host. The larva then migrates to a suitable point of entrance into the host. The full-grown larva emerges from the host about 3 to 4 weeks after oviposition and pupates.

The following experiment was performed in the spring of 1926: Fertilized females of *Carcelia* obtained from *Malacosoma americana* deposited 60 eggs on 17 tent caterpillars (*M. americana*), 2 caterpillars lived to produce 3 puparia; 114 eggs were deposited on 36 browntail moth caterpillars (*Nygmia phaeorrhoea*) and no puparia were recovered although the caterpillars lived eventually to produce adult moths. The females oviposited with equal eagerness on either form, and all the eggs hatched. Subsequent taxonomic investigation substantiated this experiment. There has never been a *Carcelia* characterized in part by the yellowish femora (*malacosomae*) reared from any field-collected larvae of the brown-tail moth at the Gypsy Moth Laboratory.

Adults, late April to the middle of June; number per host, one to three; generations, one; hibernation, in the puparium (adult characters usually not formed until the following spring).

6. *CARCELIA PROTUBERANS* (Aldrich and Webber), new combination

Zenillia protuberans ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 15, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925.

Paraxorista protuberans (Aldrich and Webber) TOWNSEND, Manual of myiology, pt. 4, p. 211, 1936.

This species is considered to be an atypic or aberrant form of *Carcelia malacosomae*, which it resembles in some of its characters. The male type and male paratype are peculiar in that instead of hibernating normally as puparia, they issue the same season. Both specimens are in poor shape, being badly rubbed, with some parts missing, and patched together with glue. The following notes are based on type material:

Type.—Head in good condition and agreeing with the description for *Carcelia malacosomae*. Thorax badly rubbed; middle and hind legs missing; one wing lacking. Abdomen attached with glue; dorsum badly rubbed; sides yellow on segments 1, 2, 3, and a little on 4, extending well up on dorsum and below on the venter.

Paratype.—Head in poor condition; hairs on the upper side of the parafacials located with the aid of the binocular high power. Thorax agreeing with *C. malacosomae*; midtibia with two median anterolateral bristles; hind tibia ciliate. Abdomen very yellow, extending farther up on dorsum and below on venter than in the type (fourth segment included).

Aldrich and Webber describe the abdomen as being "mostly yellow excepting a black vitta on the dorsum and a similar one on the venter." The amount of yellow color is far beyond that described for *Carcelia malacosomae*, in which the male abdomen is broadly black on the dorsum, with the sides rufous.

Type and paratype locality.—Rockingham, Vt.

Type.—Male, U.S.N.M. No. 25699.

Host.—*Malacosoma disstria* Hübner.

Remarks.—The two male specimens were reared at the Gypsy Moth Laboratory from material collected at Rockingham, Vt., June 12, 1915, by J. J. Culver, the flies issuing July 23–25, 1915.

7. *CARCELIA LAXIFRONS* Villeneuve

Paraxorista lucorum BRAUER and BERGENSTAMM (partim), Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 58, p. 322, 1891; vol. 60, p. 222, 1893.

Paraxorista cheloniac of authors (nec Rondani).—TOWNSEND, U. S. Dept. Agr. Bur. Ent., Tech. Bull. 12, pt. 6, 1908; Ann. Ent. Soc. Amer., vol. 4, p. 135, 1911; Proc. Ent. Soc. Washington, vol. 13, p. 165, 1911; vol. 18, pp. 1–19, 1916.—THOMPSON, Journ. Econ. Ent., vol. 3, No. 3, pp. 283–295, 1910.—

HOWARD and FISKE. U. S. Dept. Agr., Bur. Ent., Bull. 91, pp. 91, 92, 136, 257, 286, 297-300, 310, 1911.

Carcelia laxifrons VILLENEUVE, Feuille Journ. Nat., ser. 5, vol. 42, pp. 42, 90, 1912.—BAER, Zeitschr. Angew. Ent., vol. 7, p. 142 (108), 1921.—THOMPSON, Bull. Biol. France et Belgique, vol. 57, fasc. 2, p. 185, 1923; Ann. Parasitol. Humaine et Compar., vol. 4, No. 3, 1926.—CROSSMAN and WEBBER, Journ. Econ. Ent., vol. 17, p. 69, 1924.—LUNDBECK, Diptera Danica, pt. 7, p. 380, 1927.—BURGESS and CROSSMAN, U. S. Dept. Agr. Tech. Bull. 86, pp. 136-138, 1929.—THORPE, Biol. Rev., Cambridge Phil. Soc., vol. 5, No. 3, pp. 193-194, 1930.

Zenillia cheloniae of ALDRICH and WEBBER (nec Rondani), Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 31-32, 1924.

Paraxorista laxifrons (Villeneuve) TOWNSEND, Manual of myiology, pt. 4, pp. 211-213, 1936.

This species was introduced into the New England States under the name *Paraxorista cheloniae* (Rondani) and resembles very closely *Carcelia malacosomae*, which was considered previously also to be *Exorista* or *Paraxorista cheloniae* (Rondani). All the known differences are cited in the key to the species.

Distribution.—Widely distributed throughout Europe. *Carcelia laxifrons* has become established in New England. It has been recovered from many localities over practically the whole area infested by the brown-tail moth in Maine 2, New Hampshire 1, Massachusetts 8, and many other localities.

Hosts.—*Nygmia phaeorrhoea* (Donovan) 157; *Malacosoma americana* (Fabricius) 6 specimens bearing Gypsy Moth Laboratory note numbers, and 41 specimens labeled as being from this host but bearing no note numbers; *Malacosoma disstria* Hübner 5; *Porthetria dispar* (Linnaeus) 2. Lundbeck has published a European host record of *Dasychira fascelina* (Linnaeus) (Larsen).

Remarks.—The material examined consisted of 51 exotic specimens from Europe mostly reared from the brown-tail moth; 211 reared specimens bearing Gypsy Moth Laboratory note numbers except as indicated; 4 specimens bearing miscellaneous numbers from the Gypsy Moth Laboratory; one male labeled only "ex *M. americana*" removed from the *Sisyropa "eüdryae"* material; one male with puparium labeled as paratype of *Carcelia reclinata*, U.S.N.M. No. 25697, Gypsy Moth Lab. VI-16-16; and 28 field-collected specimens. Practically all the above-mentioned specimens had been identified as *Zenillia "cheloniae."*

The value of *Carcelia laxifrons* as a parasite of *Nygmia phaeorrhoea* in New England is highly dependent upon the climate, which on the average is more unfavorable because of its severity than in its more favored range in Central Europe. In this connection, it should be recalled that *C. laxifrons* emerges earlier in the spring than *Carcelia malacosomae*. Some of the most outstanding recoveries from the standpoint of numbers have been made from the Massachusetts

Cape Code area, which is milder, but at times the insect is plentiful over the whole area. One of the best records obtained is the rearing of 139 *C. laxifrons* from 200 brown-tail moth caterpillars collected at Lunenburg, Mass., in 1915.

A few specimens in the collection indicate that *Carcelia laxifrons* is rarely a parasite of *Malacosoma americana* and *M. disstria*. Mr. Webber has corroborated this under laboratory conditions by rearing puparia of *Carcelia laxifrons* (European stock) from *Malacosoma*.

Records by the writer indicate that *Carcelia laxifrons* and *Compsilura concinnata* (Meigen) have been obtained from field collections from the same host larva, *Nygmia phacorrhoea*.¹⁴ In cases of severe competition between these two species, it is considered normally that *C. concinnata* has the best chance of survival; all conditions being equal, this should occur only when the attack by both forms on a single individual does not produce a case of excessive multiple superparasitism.

Adults, late April to June; number per host, one to three; generations, one; hibernation, in the puparium (adult characters usually not formed until the following spring).

As the biology of this species has been frequently discussed in literature, only a few additional remarks will be necessary. Under laboratory conditions, crossmating or interbreeding between *Carcelia laxifrons* and *Carcelia malacosomae* is obtained only with great difficulty, and there is probably little or no interbreeding in the field.

Mr. Webber has completed a series of most interesting laboratory experiments in which *Carcelia laxifrons* (European stock) and *C. malacosomae* have been crossmated. Larvae of the brown-tail moth and both species of *Malacosoma* have been subjected to attack by both crosses. Adult progeny of these crosses were subsequently secured. It is hoped that the results of this most interesting work and its resultant effect on the taxonomic feature of the two species will be made available in the near future.

8. CARCELIA SEPARATA (Rondani)

Errorista separata RONDANI, D'pterologiae Italicae prodromus, vol. 3, pp. 134, 16, 1859.—BEZZI and STEIN, Katalog der paläarktischen Dipteren, vol. 3, p. 246, 1907.

¹⁴ It has been observed in other instances that under equal conditions of competition and host selection, a species of Larvaevoridae capable of superparasitism can coinhabit the same host specimen along with another species which is also capable of superparasitism. Whereas when a species capable only of solitary parasitism (survival of one specimen) enters into competition to coinhabit the same host specimen with another species capable of either solitary or superparasitism, only one species will survive. Several instances have been noted where *Opsosturmia nidicola* Townsend (solitary parasite) was the successful survivor in a competition with *Compsilura concinnata* even though the larva of *C. concinnata* reached third-stage maturity before it succumbed.

- Carcecia gnava* of authors (nec Meigen).—HOWARD and FISKE, U. S. Dept. Agr., Bur. Ent., Bull. 91, pp. 88, 132, 231-232, 308, 1911.—CROSSMAN and WEBBER, Journ. Econ. Ent., vol. 17, pp. 67-76, 1924.
- Carcecia separata* (Rondani) VILLENEUVE, Feuille Jeun. Nat., ser. 5, vol. 42, p. 89, 1912.—BAER, Zeitschr. Angew. Ent., vol. 7, p. p. 142 (108), 1921.—STEIN, Arch. Naturg., Abt. A, Heft. 6, p. 65, 1924.—BURGESS and CROSSMAN, U. S. Dept. Agr. Tech. Bull. 86, pp. 114-115, 1929.—BARANOFF, Institut für Hygiene und Schule für Volksgesundheit, Zagreb, Arb. parasit. Abt., No. 3, 1931.—BROWN, U. S. Dept. Agr. Circ. 176, p. 13, 1931.
- Senometopia separata* (Rondani) TOWNSEND, Manual of myiology, pt. 4, p. 209, 1936.

Head with front of male at narrowest 0.24 to 0.25 (in three specimens) and in female 0.27 to 0.29 (in three specimens) of head width; frontal row of 9 to 12 bristles in male and 5 to 7 in female, extending from a little below base of third antennal segment to 2 reclinate upper frontals (preverticals); facial ridge bristly on lowest one-fifth to one-fourth; gena one-fifteenth or less eye height; frontal orbit silvery gray, face and posterior orbit silvery white; gena grayish silvery white; antenna black, third segment three times as long as second; arista thickened on basal one-third, penultimate segment short; palpus yellow.

Throat black, silvery-gray pruinose; marked by four mesonotal vittae, median one lacking; four postsutural dorsocentral macrochaetae; ground color of scutellum yellow covered with this silvery pollen, three pairs of marginal scutellars and one decussate apical pair turned backward, one pair of discal scutellars; two sternopleural macrochaetae; legs black with tibia yellowish brown; fore tibia with one median posterolateral bristle; midtibia with one medium anterolateral bristle, inner ventral bristle lacking; hind tibia ciliate, with one longer bristle; hind coxa bare behind; wing grayish hyaline, third vein with two or three bristles at base.

Abdomen black covered with silvery pollen including shoulders of first segment; dorsal vitta very obscurely marked except on segment 2, black; in male sides of second segment red, female black; no discal macrochaetae, in female on third segment (rarely on second) 2 or 3 hairs or bristles slightly stronger than rest; first segment with 1 pair of marginal macrochaetae; second segment in male with 1 pair, in female usually 2 pairs of marginal macrochaetae; third segment with a row of marginal macrochaetae; fourth segment covered with erect bristles about one-half size of macrochaetae.

Length 8 to 9 mm.

Distribution.—Central and southern Europe. This species has been liberated in the northeastern part of the United States, but as yet it has not been recovered.

Hosts.—*Porthetria dispar* (Linnaeus) (summer host). Hibernating hosts: *Pterostoma palpinum* (Linnaeus), *Pheosia tremula*

(Clerck), *Acrionicta aceris* (Linnaeus). It has been brought through hibernation in laboratory-attacked material on *Colocasia coryli* (Linnaeus), *Abrostola tripartita* (Hufnagle), *Phalera bucephala* (Linnaeus), and *Abrostola triplasia* (Linnaeus). The records are from the Bureau's former Central European Laboratory, Budapest, Hungary.

Remarks.—The description is based on an examination of a large series of European material comprising over 34 males and 40 females, 7 of which were determined by Dr. Villeneuve.

Adults, May to August; number per host, one to several; generations, two; hibernation, as larva in host larva.

9. *CARCELIA LAGOAE* (Townsend), new combination

Exorista lagoae TOWNSEND, Ent. News, vol. 2, p. 159, 1891.

Exorista flavirostris of authors (nec Van der Wulp).—COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 100, 1897.—REINHARD, Ent. News, vol. 33, p. 72, 1922.—BISHOPP, U. S. Dept. Agr., Circ. 288, p. 13, 1923.

Carcelia flavirostris of JOHNSON (nec Van der Wulp), Diptera of Florida, 1913.

Zenillia amplexa of ALDRICH and WEBBER (nec Coquillett) partim, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 13, 1924.

This species is more like *Carcelia formosa* than *C. amplexa*. The genitalia resembles those of *C. formosa* and *C. diacrisiae*.

Head with front of male at narrowest 0.23 to 0.25 (in three specimens) and in female 0.25 to 0.27 (in three specimens) of head width; frontal row of seven or eight bristles in male and five to eight in female, extending from junction of second and third antennal segments to two strong reclinate upper frontals (preverticals); facial ridge bristly on lowest one-sixth; gena one-sixteenth or less eye height; frontal orbit, face, cheek, and posterior orbit light-gray-silvery pollinose; first, second, and upper portions of third segment of antenna red (this varies to all black), third segment from four to four and one-half times second; arista thickened on basal one-third, penultimate segment short; palpus yellow.

Thorax black covered with light-gray pollen; male with four and female with five narrow black mesonotal vittae, median one obsolete before suture in female and apparently entirely so in male; four postsutural dorsocentral macrochaetae; scutellum yellow covered with gray pollen, three pairs of marginal scutellars and one strong decussate apical pair turned backward, one pair of discal scutellars; three sternopleural macrochaetae; legs with tarsi black, tibiae and femora varying from yellow to nearly black but always concolorous; fore tibia with one median posterolateral bristle; midtibia with one median anterolateral bristle, one strong inner ventral bristle; hind tibia ciliate with one longer bristle; wing grayish hyaline, third vein with two or three bristles at base; squamae white.

Abdomen reddish yellow sparsely covered with light-gray-silvery pollen (color varying to almost black with red color showing only faintly; the pollen then more pronounced silvery); a median dorsal vitta shining black (not so pronounced in the darker form), covering whole depression on first segment in red forms (this segment entirely black in dark forms), nearly as wide as width beneath pair of marginal macrochaetae on second segment, and narrow on third segment (must be closely observed in red specimens to avoid wrong impression), broadening sharply on fourth segment; ventral membrane shining black; no discal macrochaetae, abdominal hairs depressed; first and second segments with one pair of marginal macrochaetae (pair on first segment sometimes weak or lacking in male); fourth segment irregularly tipped with marginal and submarginal bristles about one-half size of macrochaetae of marginal row on third segment.

Length 8 mm.

Type locality.—Guanajuato, Mexico.

Distribution.—District of Columbia 1, North Carolina 1, Florida 5, Mississippi 1, Texas 3, Mexico 1. Published records not duplicated above: Texas 2 (Reinhard), Virginia (Coquillett), Mexico (Townsend), Jamaica (Johnson).

Hosts.—*Megalopyge opercularis* (Abbot and Smith) 9; *M. (Lagoa) crispata* Packard 1 probably *opercularis*, *Lagoa* sp. 2. Coquillett lists all the specimens reared from *opercularis* and *crispata* as *opercularis*. Townsend reared the type specimens from *M. (Lagoa) opercularis*. Other published rearing records are *M. opercularis* (Reinhard, Bishopp).

Remarks.—The foregoing description is based on an examination of eight males and two females reared from *Megalopyge opercularis* (Hayhurst, Neal, McMeekin, Schwarz, Turner, Spencer and Weed, as listed by Coquillett); one female reared from *Lagoa* sp. (Riley); one male reared from *Lagoa* sp., North Carolina; one male and six puparia, host not listed, District of Columbia; one female, Federal District, Mexico (Conradi); two specimens from Florida bearing No. 3373.

Coquillett determined 10 and possibly 11 of the foregoing specimens as *Exorista flavirostris*, as indicated by the characters in his key in 1897. This species can be recognized from Van der Wulp's original description as not being *E. flavirostris*.

Aldrich's notes indicate that he twice examined the remnant of the type specimen *lagoae* Townsend. The type was in very poor condition, with the head lacking, front and hind legs gone, and thorax and abdomen injured by glue. Aldrich considered the specimen to be *amplexa*, and he refused to alter the nomenclature for such a poor specimen. His examination indicated that the specimen had four and

three postsutural dorsocentrals, and three acrostical macrochaetae; sternopleural macrochaetae probably three; midtibiae with one median anterolateral bristle and one inner ventral bristle; no discal macrochaetae.

This material must be removed from *Carcelia amplexa*, and *Carcelia lagoae* covers the requirements of the species. Although the major morphological characters are the same, the author is perplexed by the variation in color between the light and dark forms. While the extreme limits are readily separable, no clear-cut demarcation could be found for the intermediate specimens.

Adults, June to October, although many of Coquillett's specimens issued during the winter months; number per host, one to several; hibernation, in the host larva or cocoon; generations, uncertain as to number.

10. *CARCELIA FLAVIROSTRIS* (Van der Wulp), new combination

Exorista flavirostris VAN DER WULP, *Biologia Centrali-Americana*, Diptera, vol. 2, p. 69, 1890.

Zenillia amplexa of ALDRICH and WEBBER (nec Coquillett), partim, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 13, 1924.

Head with front of male at narrowest 0.24 and in female 0.26 (one specimen) of head width; frontal row of eight or nine bristles in male and six in female, extending from base of third antennal segment to two reclinate upper frontals (preverticals); outer vertical bristle present in female, lacking in male; facial ridge bristly on lowest one-half; gena one-eighteenth eye height; frontal orbit, face, and posterior orbit silvery-white pollinose, frontal orbit and upper half of posterior orbit tinged with yellow, giving a slight brassy appearance; antenna black, nearly reaching oral cavity, third segment of male over five times and in female four times second; arista thickened on basal one-fourth and located almost at base of third antennal segment, penultimate segment short; palpus yellow.

Thorax black-gray pollinose; marked with four black mesonotal vittae: four postsutural dorsocentral macrochaetae; scutellum mostly black tipped with reddish yellow, three pairs of marginal scutellars and one apical pair, one pair of discal scutellars; two sternopleural macrochaetae; legs black; fore tibia with one median posterolateral bristle; midtibia with one median anterolateral bristle, one small inner ventral bristle; hind tibia ciliate, with one longer bristle; third vein of wing with two bristles at base, squamae white.

Abdomen black covered with light-gray pollen; first segment, posterior third of second and third segments, posterior half of fourth segment, and narrow dorsal vitta shining black; abdominal hair depressed on second and third segments in female; fourth segment with a row of discal macrochaetae, pollen of fourth interrupted at this

point; first and second segments with one pair of marginal macrochaetae, third with a marginal row of macrochaetae, and fourth tipped with marginal bristles; fourth segment of male with a striking thatch or dense group of bristles on sides extending straight back.

Length 7.5 to 8 mm.

The puparium resembles that of *Carcelia reclinata*.

Type series localities.—Orizaba (Veracruz) and Teapa (Tabasco), Mexico.

Distribution.—Puerto Rico 1, Mexico 2.

Type series.—British Museum.

Hosts.—"Larva on calabash tree" 4, *Megalopyge krugii* Dewitz 1.

Remarks.—The description is based on an examination of one male and three females reared from "larva on calabash tree" in January 1912 (Hooker); one female reared from *Megalopyge krugii* (Van Zwalenburg).

The writer had the privilege of examining the type series of *Exorista flavirostris* Van der Wulp in the British Museum. This series consisted of one male and two females, which varied as follows from the foregoing description: Male with six frontal bristles, female with six varying from five to seven; facial ridge bristly on lowest one-third; one female lacked the brassy tinge to parafrontals, which were slightly blackish toward vertex (junction of second and third antennal segments of this female reddish).

Thorax bluish-silvery-gray pollinose, male with shoulders and extreme sides golden pollinose, one female faintly golden-pollinose and other female lacking golden tinge; scutellum yellow, blackish in one female; male with one strong and one weak sternopleural macrochaetae on one side and only one on other.

Abdomen with golden tingle to pollen; abdominal hairs suberect in male. The female that lacked the brassy tinge to the parafrontals lacked the golden tinge to the pollen of the thorax and abdomen.

The discrepancies are minor in character, and the writer questions the desirability at this time of considering the Puerto Rican specimens other than *Carcelia flavirostris*.

11. CARCELIA DIACRISIAE, new species

Zenillia n. sp. (4) SCHAFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 113, 1934.

Although a larger fly, this species resembles *Carcelia perplexa*. It differs in having the legs and abdomen wholly black, the front tibia with only one long posterolateral bristle instead of two, and the dorsal vitta obscure except on the basal half of the second segment. The genitalia of the two forms are very distinct. The puparia are different.

Male (type).—Head with front at narrowest part 0.23 head width; frontal row of nine bristles, extending from on a level with middle of second antennal segment to two strong reclinate upper frontals (pre-verticals); facial ridge bristly on lowest one-sixth; gena less than one-fifteenth eye height; frontal orbit, face, cheek, and posterior orbit silvery-gray pollinose; antenna black, third segment five times as long as second; palpus yellow.

Thorax shining black covered with gray pollen; five black mesonotal vittae, median one obsolete before suture, inner pair well defined, outer pair interrupted at suture; four postsutural dorsocentral macrochaetae; scutellum black, faintly yellow, on apical half covered with gray pollen, three pairs of marginal scutellars and one strong decussate apical pair directed backward, disk covered with erect hairs and bearing one pair of discal scutellars; two sternopleural macrochaetae; legs wholly black; fore tibia with one median posterolateral bristle; middle tibia with one median long stout anterolateral bristle, one long inner ventral bristle; hind tibia ciliate, with one longer bristle near middle; wing grayish hyaline, third vein with two to three bristles at base, squamae white.

Abdomen black, wholly covered with gray pollen except dorsum of first segment, which is shining black, usual black dorsal vitta obsolete except on basal half of second segment; first and second segments with a marginal pair, third and fourth with a marginal row of macrochaetae; no discals.

Hypopygium rufous; inner forcep in profile long and tapering, outer side strongly and evenly curved from tip to base, inner side if divided into sevenths tapering abruptly on sixth portion to form a tooth out of seventh; outer forceps two-thirds length of inner, strongly appressed against inner side of inner forceps, in profile sides of outer forceps parallel, ending bluntly, apical one-third thickly beset with numerous small spines (viewed under binocular high power).

Length 10 mm.

Female (allotype).—Front at its narrowest part 0.24 head width; frontal row of six bristles, extending upward from on a level with base of third antennal segment; two pairs of fronto-orbital bristles; third segment of antenna slightly less than four times second; arista thickened on basal one-fourth; penultimate segment short. Pulvilli one-half length of those of male; base of third vein with one or two bristles. Fourth segment of abdomen lacking macrochaetae, covered with erect bristles about one-half size of macrochaetae on third segment. Except for hypopygium, remainder of description same as for male.

Length 10 mm.

The paratype material varies as follows from the descriptions: Width of male front 0.22 to 0.23, female 0.24 to 0.25; frontal bristles in male seven to eight, in female five to six; two male paratypes with three sternopleurals on one side; one female paratype with two median posterolateral bristles on fore tibiae.

Type locality.—Lafayette, Ind.

Allotype locality.—Somerville, N. J.

Distribution.—New Jersey 1, Maryland 2, Virginia 1, Indiana 1.

Type.—Male, U.S.N.M. No. 54150.

Hosts.—*Diacrisia virginica* (Fabricius) 3, *Estigmene acraea* (Drury) 1, 2 unknown hosts bearing Riley note numbers.

Remarks.—The material examined consisted of type, September 15, 1917 (Aldrich), allotype (No. 11715 L3C), male paratype (No. 11715 L4), female paratype (No. 11715 L3) reared from *Diacrisia virginica*, Somerville, N. J. (Gypsy Moth Laboratory); one male paratype 491 L—491 L^o (Riley); one male paratype 2906^o, February 21, 1887; four male paratypes and two female paratypes, Lafayette, Ind. (Aldrich); one male paratype, Dead Run, Fairfax County, Va., June 22, 1915 (Shannon); one reared specimen bearing Gypsy Moth Laboratory note number; and three males and two females (Aldrich, Shannon, and Palmer).

Three of the paratype specimens had been previously determined by Tothill as *griseomicans*. These three specimens are not Van der Wulp's concepts of *griseomicans*. See comments under *Carcelia amplexa*, Remarks.

Adults, May to September; number per host, one; generations, two; hibernation, in puparium.

12. CARCELIA AMPLEXA (Coquillett), new combination

Exorista amplexa COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, pp. 97-98, 1897.—THOMPSON, Journ. Econ. Ent., vol. 3, p. 291, 1910; Psyche, vol. 17, No. 5, pp. 210-211, 1910.—GREENE, Proc. U. S. Nat. Mus., vol. 60, art. 10, p. 25, fig. 61 (puparium), 1922.—HILL, U. S. Dept. Agr. Dept. Bull. 1336, p. 17, 1925.

Exorista griseomicans of COQUILLET (nec Van der Wulp), U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 98, 1897.

Sisypopa hemerocampae TOWNSEND, Ann. Ent. Soc. Amer., vol. 2, p. 248, 1909; Proc. Ent. Soc. Washington, vol. 14, pp. 165-166, 1912; Ann. Ent. Soc. Amer., vol. 8, p. 89, 1915.

Zenillia amplexa (Coquillett) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 13-14, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 161, p. 814, 1928.—SCHAFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 111, 1934.

Oæxorista amplexa (Coquillett) TOWNSEND, Manual of myiology, pt. 4, p. 211, 1936.

Oæxorista hemerocampae (Townsend) TOWNSEND, Manual of myiology, pt. 4, p. 211, 1936.

Head with front of male at narrowest 0.20 to 0.23, usually 0.21, and in female 0.24 to 0.27, mostly 0.24, of head width; frontal row of seven to nine bristles in male and five to seven in female, extending from apex of second antennal segment to two strong reclinate upper frontals (preverticals); facial ridge bristly on lowest one-sixth; gena less than one-fifteenth eye height; frontal orbit, face, cheek, and posterior orbit light-gray-silvery pollinose; third segment of antenna black, first and second segments varying from red to black but usually red, third segment four and one-half times second in male and four times in female; arista thickened on basal one-fourth, penultimate segment short; palpus yellow.

Thorax black usually gray-pollinose although quite often with a tawny tinge; five black mesonotal vittae, the median one obsolete before the suture; three or four postsutural dorsocentral macrochaetae, usually four, sometimes three on one side and four on the other; scutellum yellow covered with gray pollen, three pairs of marginal scutellars and one smaller but strong decussate apical pair turned backward, disk with one pair of discal scutellars; two sternopleural macrochaetae; legs with tarsi black; tibiae, femora, and coxae yellow, concolorous; fore tibia with two median posterolateral bristles; mid-tibia with one median anterolateral bristle, inner ventral weak or lacking, usually present, shorter than and situated on a level with or nearer the tarsus than the lower of the two median posterolateral bristles; hind tibia evenly ciliate, with one longer bristle near middle; wing grayish hyaline, third vein with one or two bristles at base, squama white.

Abdomen covered with gray pollen, sometimes with a tawny tinge except on dorsum of first segment and the very narrow (pencil line) dorsal vitta; although somewhat obscured by pollen, ground color of venter and sides reddish yellow extending up onto dorsum somewhat on first, second, third, and sometimes basal portions of fourth segment; ground color of dorsum, usually entire fourth segment, and ventral membrane black; first and second segments with a pair and third with a marginal row of macrochaetae, fourth segment covered with erect bristles about one-half size of macrochaetae on third; usually without discals, but over 10 percent of specimens examined had a nicely formed pair on third segment, and 2 specimens out of 90 had a pair of discals on second as well as on third segment; one specimen lacked marginal pair of macrochaetae on second segment.

Length 7 to 9 mm.

Type locality.—Mount Washington, N. H.

Distribution.—Maine 1, New Hampshire 1, New York 2, New Jersey 5, Pennsylvania 1, Ontario 1. Published records not duplicated above: Massachusetts (Townsend, Johnson, Schaffner and Griswold),

Rhode Island (Johnson, Schaffner and Griswold), Connecticut (Schaffner and Griswold), New York 4 (West), New Jersey (Smith), District of Columbia (Coquillett, Townsend), Maryland (Hill), Kansas (Tucker), Quebec (Winn and Beaulieu), Puerto Rico (Wolcott). Owing to the confusion surrounding the earlier identity of this species, the author is of the opinion that some of the above recorded published records may be erroneous.

Type.—Female, U.S.N.M. No. 3596.

Hosts.—*Hemerocampa leucostigma* (Abbot and Smith) 90; *Notolophus antiqua* (Linnaeus) 1, *Porthetria dispar* (Linnaeus) 1. Published records: *Plathyphena scabra* (Fabricius) (Hill) and *Ecpanttheria eridanus* (Cramer) (Wolcott).

Remarks.—The foregoing description is based on an examination of the type specimen; the female type, *Sisyropa hemerocampae*, U.S.N.M. No. 12623, G.M.L. 820-0 07TD 2060 B, previously determined as *Exorista griseomicans* by Coquillett; 90 reared specimens bearing Gypsy Moth Laboratory note numbers; one male reared from *Notolophus leucostigma* (Schoene); two females G.M.L. 558 T (one without ocellar bristles); one male and three females, 205⁰⁴⁷ July 1896 labeled as *griseomicans*; one male and one female, 5332 B and 5332 BC, female labeled *griseomicans*; two males and one female, G.M.L. 2685 A, August 1909, labeled as *S. hemerocampae*; one male, 205⁰⁴³, July 23, 1897; one female, Toronto, Ontario (Brodie).

The species as now constituted is still a variable one. The main variable factors are the color of the first two segments of the antenna being red or black, three or four dorsocentrals, and the inner ventral bristle of the midtibia being weakly present or lacking. As there is no clear line of demarcation, nothing is to be gained by recognizing these variations as having specific status. The writer was unable to find any correlation between these factors or any others noted that would warrant further restricting the material placed here.

Adults, June to October; number per host, one; generations one or two depending upon the locality; hibernation, in the puparium.

In the past there has been a tendency to refer some specimens of *Carcelia amplexa* and *C. diacrisiae* to *Exorista griseomicans* Van der Wulp. The writer had the privilege of examining the type series of *E. griseomicans*, which is located in the British Museum. This material is a composite series composed of three species of *Carcelia* which resemble, but are distinct from *C. formosa*, *C. gnava*, and *C. lagoae*.

13. CARCELIA PERPLEXA, new species

Zenillia amplexa of ALDRICH and WEBBER (nec Coquillett), partim, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 13-14, 1924.

Zenillia n. sp. (2) (partim) SCHAFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 113, 1934.

This species closely resembles *Carcelia amplexa*. The species is less variable, and several small characters serve to differentiate it from *C. amplexa*. It does not have the concolorous femora and tibiae.

Male (type).—Head with front at its narrowest 0.22 head width; frontal row of 11 bristles, extending from base of third antennal segment to three reclinate upper frontals (one reclinate upper frontal and two preverticals); numerous fine hairs outside row of frontal bristles; facial ridge bristly on lowest one-fifth; gena less than one-fifteenth eye height; frontal orbit, face, cheek, and posterior orbit silvery-gray pollinose with a tinge of black; antenna black, third segment four times second; arista thickened on basal one-fourth, penultimate segment short; palpus yellow.

Thorax black covered with gray pollen; five black mesonotal vittae, median one obsolete before suture; four postsutural dorso-central macrochaetae; scutellum yellow covered with gray pollen, three pairs of marginal scutellars and one smaller but strong decussate pair turned backward; disk covered with erect hairs and bearing one pair of discal scutellars; two sternopleural macrochaetae; legs with tarsi, femora, and coxae black; tibia yellow; fore tibia with two median posterolateral bristles; midtibia with one anterolateral bristle, one inner ventral bristle at least as long as and situated higher on tibia toward femur than the lower of the two median posterolateral bristles; hind tibia ciliate with one longer bristle near middle; wing grayish hyaline, third vein with two bristles at base; squamae white.

Abdomen covered with gray pollen except on dorsum of first segment and narrow vitta; although somewhat obscured by pollen, ground color of sides reddish yellow on first, second, and third segments extending on to venter and dorsum somewhat; ground color of dorsum and venter, including ventral membrane, and entire fourth segment black; first and second segments with a pair and third with a marginal row of macrochaetae; no discals; fourth segment covered with erect bristles about one-half size of macrochaetae on third; abdominal hairs erect

Length 8 mm.

Female (allotype).—Front at its narrowest 0.25 head width; six frontal bristles on one side, seven on other, only two reclinate upper frontal bristles (preverticals); hairs outside frontal row noticeable but not quite so numerous as in male; two pairs of fronto-orbital bristles; facial ridge bristly on lowest one-sixth; third segment of antenna slightly less than four times second. Reddish-yellow area on side of abdomen not so extensive as in male. The pulvilli one-half length of those of male. Otherwise the description is the same as for the male.

Length 8 mm.

The paratype material differs as follows from the descriptions: Front of male from 0.20 to 0.24 but usually 0.22, female from 0.24 to 0.26; frontal bristles from 8 to 13 but usually 10 or 11 in male, from 5 to 8 but usually 6 or 7 in female; male usually with 3 reclinate upper frontals; facial ridge bristly on lowest one-fifth; third joint of antenna from three and one-half to four times second. Wing with from 1 to 3 bristles at base of third vein but usually 2.

Length 5.5 to 8 mm.

Type and allotype locality.—Trenton, N. J.

Distribution.—Maine 2, Massachusetts 4, Connecticut 1, New York 3, New Jersey 2.

Type.—Male, U.S.N.M. No. 54151.

Hosts.—*Hemerocampa leucostigma* (Abbot and Smith) 26; *Olene plagiata* (Walker) 1.

Remarks.—Material examined consisted of the following reared specimens bearing Gypsy Moth Laboratory note numbers: Type and allotype, No. 11718 N3i; three male paratypes, 11718 N3i; one male paratype, Trenton, N. J., No. 11718R1h; three male paratypes, Brooklyn, N. Y., Nos. 11718 K1d, 11718 K1 and 21, 11718 N1j; one female paratype, Trenton, N. J., No. 11718 N3j; two female paratypes, Brooklyn, N. Y., No. 11718 A3; one female paratype, Brooklyn, N. Y., No. 11718 N1o; one female paratype, Somerville, N. J., No. 11718 H7; one female paratype, Everett, Mass., No. 12108 L1; one female paratype, Berlin, Conn., No. 12108 R5; nine reared specimens bearing Gypsy Moth Laboratory note numbers; one male, 205⁴²⁹ April 14, 1896; one female G. M. L. 2603C, May 16, 1910.

Although the writer can readily separate this species from *Carcelia amplexa* on characters that have proved specific elsewhere in the genus *Carcelia*, he is perplexed by the coincidence that practically all the specimens of both series have been reared from the common host *Hemerocampa leucostigma*. As both species were previously considered one, it is perhaps desirable to cite this common host relationship. Subsequent material may indicate even more divergent lines of host selection.

Adults, May to July; number per host, one to several; generations, one; hibernation, in the puparium.

14. CARCELIA OLENENSIS, new species

Zenillia amplexa of ALDRICH and WEBER (nec Coquillett), partim, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 13-14, 1924.

Zenillia n. sp. (2), partim, SCHAFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 113, 1934.

This species can be easily confused with *Carcelia perplexa*.

Male (type).—Except as otherwise noted, the description is the same as for the type male of *Carcelia perplexa*. Frontal row of seven and nine bristles, extending from base of third antennal segment to two reclinate preverticals, facial ridge bristly on the lowest one-sixth; frontal orbit, face, cheek, and posterior orbit silvery-gray pollinose.

Thorax black, thinly covered with gray pollen with marked bluish tinge; midtibia with inner ventral bristle lacking; third vein of wing with one bristle at the base.

Abdomen (type greasy, pollen pattern taken from paratype) thinly covered with light-gray pollen with a decided bluish tinge; first segment, apical margin of second and third segments, and dorsal vitta shining black; ground color predominantly black with reddish-yellow area on sides of the first, second, and third segments; one pair of weak discal macrochaetae on third segment; abdominal hairs on discal region long, fine, and erect.

Length 8 mm.

Female (allotype).—Front at its narrowest 0.28 head width; six frontal bristles on one side, seven on the other, two pairs of frontal orbital bristles; facial ridge bristly on the lowest one-eighth; third segment of antenna about three and one-half the second. Midtibia with inner ventral bristle; pulvilli one-half length of those of male; third vein of wing with two bristles at the base. Abdomen black, a very small and faint reddish yellow spot on side; no discal macrochaetae on third segment. Otherwise the description is the same as for male.

Length 8 mm.

The paratypes differ as follows from the descriptions: Front of male 0.20 and 0.21; frontal bristles usually eight in the male, from four to eight, averaging six, in the female. Male midtibia with a small or weak inner ventral bristle; third vein of wing with one or two bristles at the base. No discal macrochaetae on third segment of abdomen; one female with a black abdomen and one female with a reddish-yellow area on sides.

Length 7 to 9 mm.

Type and allotype locality.—Saugus, Mass.

Distribution.—Massachusetts 3.

Type.—Male, U. S. N. M. No. 54152.

Host.—*Olene atomaria* (Walker) 12.

Remarks.—Material examined consisted of the following reared specimens bearing Gypsy Moth Laboratory note numbers: Type and one male paratype, No. 10093 L4; allotype, two male paratypes, and one female paratype, No. 10093 L3; one female paratype, Weston, Mass., No. 10093 J7; three males and two females (all headless), Bolyston, Mass., No. 10093 J5.

Adults, June; number per host, one to several; generations, one; hibernation, in the puparium.

15. *CARCELIA YALENSIS*, new species

Zenillia amplexa of ALDRICH and WEBBER (nec Coquillett) (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 13-14, 1924.

Zenillia n. sp. (2) (partim), SCHLAFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 113, 1934.

This species is most easily confused with *Carcelia perplexa* and *C. diacrisiae*. The male, which is most likely to be confused with *C. perplexa*, is separated only by the blacker abdomen and the lack of reclinate frontal bristles other than the two reclinate preverticals. In the female the black abdomen and the two pairs of marginal macrochaetae on the second segment serve to separate this species from *C. perplexa*; while the fore tibia with two posterolateral bristles, second segment of the abdomen with two pairs of marginal macrochaetae, narrow dorsal vitta, and apical margins on segments 2 and 3 readily separate this species from *C. diacrisiae*.

Female (type).—Head with front at narrowest 0.30 head width; frontal rows of eight bristles, extending from below arista to two reclinate upper frontals (preverticals), frontal bristles on parafacial situated halfway between facial ridges and eye margin; facial ridge bristly on lowest one-fifth; gena less than one-fifteenth eye height; frontal orbit, face, and posterior orbit light-gray-silvery pollinose; antenna black, third segment slightly more than three times second; arista thickened on basal two-fifths, penultimate segment short; palpus yellow.

Thorax covered with gray pollen; five black mesonotal vittae; four postsutural dorsocentral macrochaetae; scutellum yellow, three pairs of marginal scutellars and one decussate apical pair, one pair of discal scutellars; two sternopleural macrochaetae; legs with tarsi and femora black, tibiae brown (yellowish); fore tibia with two median posterolateral bristles; midtibia with one median anterolateral bristle, one strong inner ventral bristle; hind tibia ciliate, with one longer bristle near middle; wing with two to three bristles at base of third vein; squamae white.

Abdomen black covered with thin light-gray pollen, heavier on sides and bases of segments; first segment, narrow apical margin of second and third segments, and narrow dorsal vitta shining black; first segment with one pair, second with two pairs, and third with a row of marginal macrochaetae; fourth segment covered with erect bristles one-half size of macrochaetae of third segment; no discal macrochaetae; hairs erect on discal areas, depressed on sides of second segment, and suberect on sides of third.

Length 8 mm.

Male (allotype).—Head with front at narrowest 0.24 head width; frontal row of 9 or 10 bristles, extending from on a level with arista to 2 reclinate preverticles; facial ridge bristly on lowest one-sixth; gena one-fifteenth eye height; frontal orbit, face, and posterior orbit light silvery-gray pollinose; antenna black, third segment four times second; arista thickened on basal one-third, penultimate segment short. Pulvilli long. Abdomen black, covered with gray pollen, second segment with one pair of marginal macrochaetae; abdominal hairs erect. Otherwise the description is the same as for the female.

Length 6.5 mm.

The female paratype material differs as follows: Front 0.27 to 0.29; frontal bristles from five to seven, usually six; third joint of antenna from three and one-quarter to four times the second. Abdomen black, more heavily covered with gray pollen.

Length 8 to 9 mm.

Type and allotype localities.—Yale, Idaho, and Altmar, N. Y.

Distribution.—Maine 1, New Hampshire 1, Massachusetts 1, New York 1, Idaho 1, California 1.

Type.—Female, U.S.N.M. No. 54153.

Hosts.—*Notolophus antiqua* (Linnaeus) 5, *Hemerocampa leucostigma* (Abbot and Smith) 1, *Halisidota tessellaris* (Abbot and Smith) 2, cocoon of caterpillar on *Abies concolor* 2.

Remarks.—Material examined consisted of the female type, Yale, Idaho, July 28, 1927 (Aldrich) and the following reared specimens bearing Gypsy Moth Laboratory note numbers: Allotype, No. 12109 N11; one female paratype, Everett, Mass., 12108 K6; one female paratype, Bangor, Maine, 12109 M7a; one female paratype, Altmar, N. Y., 12109 N11; one female paratype, Duane, N. Y., 12109 P6; one female paratype, Claremont, N. H., 12131 D8; one headless female, 12109 J9; one badly rubbed and battered male, 11757 H6; and one male and one female, Signal Peak, Mariposa County, Calif., December 1907 (Miller).

4. Genus *APLOMYA* Robineau-Desvoidy

Aplomya ROBINEAU-DESVOIDY, Mém. Acad. Sci. Inst. France, vol 2, p. 184, 1830; Histoire naturelle des diptères des environs de Paris, vol. 1, p. 459 [on page 460 (*A. zonata* Robineau-Desvoidy) = *Tachina confinis* Fallen], 1863.—COQUILLETT, Proc. U. S. Nat. Mus., vol. 37, pp. 509, 553, 1910.—TOWNSEND, Manual of myiology, pt. 3, p. 231, 1936. [Genotype, (*A. zonata*) = *Tachina confinis* Fallen. By designation of Robineau-Desvoidy, 1863, in synonymy.]

Huebneria ROBINEAU-DESVOIDY, Ann. Soc. Ent. France, p. 601, 1847; Histoire naturelle des diptères des environs de Paris, vol. 1, p. 279 [(*Carcelia nigripes* Robineau-Desvoidy) = *Tachina affinis* Fallen], 1863.—COQUILLETT, Proc. U. S. Nat. Mus., vol. 37, p. 553, 1910.—TOWNSEND, Manual of myiology, pt. 4, pp. 209, 212, 1936. [Genotype, (*C. nigripes*) = *Tachina affinis* Fallen. By designation of Robineau-Desvoidy, 1863, in synonymy.]

Exorista of authors (nec Meigen) COQUILLET (partim), U. S. Dept. Agr. Div. Ent., Tech. Bull. 7, p. 91, 1897.—BAER (partim), Zeitschr. Angew. Ent., vol. 7, p. 112, 1921.—STEIN (partim), Arch. Naturg., Abt. A., Hef 6, p. 67, 1924.—LUNDBECK (partim), Diptera Danica, pt. 7, p. 307, 1927.—BARANOFF (partim), Institut für Hygiene und Schule für Volksgesundheit, Zagreb, Arb. parasit. Abt. No. 3, 1931.

Zenillia of authors (nec Meigen).—BAER (partim), Zeitschr. Angew. Ent., vol. 7, p. 118, 1921.—ALDRICH and WEBBER (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 1-43, 1924.—LUNDBECK (partim), Diptera Danica, pt. 7, p. 337, 1927.

Collatia CURRAN, Families and genera of North American Diptera, p. 464, 1934.—TOWNSEND, Manual of myiology, pt. 4, p. 224, 1936. (Genotype, *Zenillia submissa* Aldrich and Webber. Monotypic.) (New synonymy.)

Inasmuch as *Exorista* Meigen has been restricted to *larvarum* and its congeners, *Aplomya* is the oldest name available to represent roughly the generic equivalent of *Exorista* of authors (s. s.), Baer, Lundbeck, etc., or a limited portion of *Exorista* of authors (s. l.), Stein, Baranoff, etc. The species now referred to *Aplomya* that were known to Aldrich and Webber in 1924 were placed in three of the four subgenera of their composite genus *Zenillia*. *Huebneria* has been accepted as a synonym of *Aplomya* by some of the best authorities. *Huebneria* represents a transitional phase between *Paraexorista* and *Aplomya*; it has some characteristics of both. Curran, in establishing the genus *Collatia* on the character of "the propleura haired on the middle portion," has contradicted his opinion that "In many genera the propleura is haired but in some this character is not reliable." The writer believes that the best procedure is to leave *Collatia submissa* (Aldrich and Webber) in the genus *Aplomya*. Townsend places *Aplomya* in the tribe Phrynoini, *Huebneria* in the tribe Carceliini, and *Collatia* in the tribe Lydellini. *Aplomya* exhibits probably a more heterologous composition than any of the other genera proposed in this paper. The bionomic relationships are more obscure than they are in the other genera previously discussed.

Aplomya can be separated without difficulty from *Phryxæ*, *Thelymyia*, and *Chrysophryxæ*. In *Aplomya* the front at the vertex is one-third or less the width of the head; the front is narrower in the male than in the female, with somewhat diverging margins; and the claws and pulvilli are more elongate in the male than in the female. *Carcelia* will not be confused with *Aplomya*, as in the latter genus the eye does not occupy the whole side of the head; the gena is at least one-tenth the eye height, usually more; and there are always three or four sternopleural macrochaetae. The following characters will readily serve to differentiate *Aplomya* from *Sisyropa*: Scutellum with three pairs of marginal scutellars and an apical pair; hind tibia usually with unequal bristles, sometimes weakly ciliate in some species. A little practice should enable one to separate *Aplomya* and

Zenillia, but caution is advised in order that mistakes may be avoided. In *Aplomya* the abdomen is of ordinary form.

All the species of *Aplomya* possess an inner ventral bristle on the mid tibia. *Aplomya affinis* and *A. estigmenensis* of this genus have two bristly hairs behind on the apex of the hind coxa. All the other species lack these bristly hairs excepting *Aplomya epicydes*, in which they are present on some of the specimens.

The following grouping of the species placed in *Aplomya* is suggested for those workers who prefer or insist on restricted genera or a definition of species groups:

1. *confinis, theclarum (Aplomya)*.
2. *mitis, caesar, confusionis*.
3. *trisetosa*.
4. *submissa (Collatia)*.
5. *affinis, helvina crassiseta, estigmenensis (Huebneria)*.
6. *epicydes, imitator, trichosomae*.
7. *fronto, phcosiae, cerurae, neurotomae*.
8. *setinervis*.
9. *polita*.

The first four groups are the most characteristic of *Aplomya*, but they have distinctive characters of their own. Groups 5 and 6 are closely related and are characteristic of *Huebneria*. Groups 8 and 9 are very similar in many respects.

KEY TO THE SPECIES OF APLOMYA

There are 20 species included in the key, 17 of which occur in the Nearctic and 3 in the Palearctic realm. Inasmuch as *Aplomya mitis* has been released in the northeastern and north-central parts of the United States, it is included in the key. *Aplomya confinis* and *A. affinis* are included because the names have been utilized to refer to indigenous Nearctic species in our literature for the past 40 to 50 years. It was considered that the inclusion of the 3 Palearctic species would increase the systematic value of the key and eliminate possible confusion as to the usage of these specific names.

- | | |
|--|-------------------------------------|
| 1. Sternopleural macrochaetae three..... | 4 |
| Sternopleural macrochaetae four..... | 2 |
| 2. Postsutural dorsocentral macrochaetae four; scutellum reddish yellow, black at base; apical scutellars curved backward, decussate; no discal bristles or macrochaetae on second and third abdominal segments..... | 3 |
| Postsutural dorsocentral macrochaetae three; middle portion of propleura hairy; scutellum black; apical scutellars erect or proclinate, decussate; front at vertex very narrow; one pair of discal macrochaetae on second and third abdominal segments (male only) | |
| 1. <i>submissa</i> (Aldrich and Webber) (p. 75) | |
| 3. Disk of scutellum covered with long, fine, erect hairs; with a discernible pair of discal scutellars (Palearctic species)..... | 2. <i>confinis</i> (Fallen) (p. 75) |

Disk of scutellum covered with long, fine, erect hairs; there is a tendency to lack a discernible pair of discal scutellars (Nearctic species)

3. *theclarum* (Scudder) (p. 76)

4. Postsutural dorsocentral macrochaetae four..... 7
 Postsutural dorsocentral macrochaetae three..... 5
 5. Palpus yellow; costal spine short..... 6
 Palpus brownish yellow; costal spine long; front at vertex about one-third width of head, of about equal breadth in both sexes; third segment of antenna hardly twice length of second; arista thickened on more than basal one-half, penultimate segment elongate; pulvilli of male only slightly longer than pulvilli of female..... 4. *trisetosa* (Coquillett) (p. 78)
 Palpus black, costal spine short; arista thickened on basal one-fourth to one-third, penultimate segment short

8. *crassiseta* (Aldrich and Webber) (p. 84)

6. Middle tibia with three or more median anterolateral bristles; three sternopleural macrochaetae; scutellum rufous, black at base; apical scutellars strong, more or less erect; discal macrochaetae on second and third abdominal segments somewhat numerous and irregularly arranged; third segment of antenna about twice length of second

{Nearctic species} 5. *estigmenensis*, new species (p. 79)
 {Palearctic species} 6. *affinis* Fallen (p. 81)

Middle tibia with one median anterolateral bristle; third vein bristly to small cross vein; two sternopleural macrochaetae and a sternopleural bristle; scutellum black; apical scutellars weak; no discal macrochaetae on second or third abdominal segments; third segment of antenna more than three times the second..... 7. *setinervis* (Coquillett) (p. 83)

7. Palpus yellow..... 12
 Palpus black or predominantly so..... 8

8. Scutellum black; apical scutellars turned backward..... 9

Scutellum yellow on apical half and black on basal half; apical scutellars erect or proclinate; subapical scutellar bristles very long, reaching to third abdominal segment..... 8. *crassiseta* (Aldrich and Webber) (p. 84)

9. Several small hairs on upper part of parafacial situated directly below lowest frontal bristles; two pairs of discal macrochaetae or bristles on second and third abdominal segments, anterior pair often weaker; one reclinate prevertical bristle, female sometimes with two..... 11

Small hairs directly below lowest frontals lacking; one pair of discal macrochaetae on second and third abdominal segments; two reclinate prevertical bristles..... 10

10. Midtibia with one median anterolateral bristle; third segment of antenna in male four and one-half and in female four times length of second segment; arista thickened on basal one-third, penultimate segment about as long as broad..... 9. *neurotomae*, new species (p. 85)

Midtibia with two or three median anterolateral bristles; third segment of antenna in male three and one-half and in female twice length of second; arista thickened on basal one-third to two-fifths, penultimate segment long..... 10. *confusionis*, new species (p. 86)

11. Parafrontal, face, and gena silver-gray pollinose (some specimens with a distinct tawny or brassy tinge to parafrontal) in female, with parafrontal becoming blacker toward the vertex; front at narrowest in male about 0.25 and in female 0.29 head width; third segment of antenna in male four and in female three times length of second segment; arista thickened on basal two-fifths in male, on basal one-third in female, penultimate segment elongate

(more noticeably so in male); some tendency exhibited, especially in the specimens from leaf-rollers, for upper of two median anterolateral bristles on midtibia to be less than one-half length of lower bristle. Female with one strong reclinate prevertical, often with uppermost frontal bristle reclinate, the females from *Pyrausta nubilalis* often with additional smaller preverticals..... 11. *caesar* (Aldrich) (p. 88)

Parafrontal, face, and gena blackish-smoky-gray pollinose in male, silver gray in female, with parafrontals becoming blacker toward vertex (parafrontal never with a distinctive tawny or brassy tinge); hairs, at least in male, larger and more profuse outside and below frontal bristles; front at narrowest in male about 0.22 and in female about 0.31 head width; third segment of antenna in male three and in female two and one-half times length of second segment; arista thickened on basal one-third, penultimate segment short, at most hardly longer than broad; midtibia with at least two median anterolateral bristles, the upper being more than half length of lower, females especially with an additional small bristle above upper bristle. Female with at least two strong reclinate preverticals located definitely outside row of frontal bristles; a darker species, not so heavily pollinose as *caesar*, pollen of second abdominal segment confined more to the base and sides..... 12. *mitis* (Meigen) (p. 90)

12. Discal macrochaetae or bristles on both second and third abdominal segments either regularly or irregularly arranged..... 14

No discal macrochaetae or bristles on second and usually lacking on third abdominal segment..... 13

13. Parafrontal silvery pollinose, blacker toward vertex; thorax and abdomen shining black, thinly silvery-gray pollinose at most; midtibia with one median anterolateral bristle; no discal bristles; first and fourth abdominal segments shining black; a little patch of dense hairs on the sides of the third and fourth segments (male only)---- 13. *polita* (Coquillett) (p. 90)

Parafrontal golden-pollinose; thorax and abdomen predominantly golden-pollinose; midtibia with two median anterolateral bristles; third segment (in some females) varying from no discals to a pair of discal macrochaetae sometimes irregularly placed; dorsum of all four segments golden-pollinose.

14. *helvina* (Coquillett) (p. 91)

14. Midtibia with one median anterolateral bristle, sometimes with a smaller additional bristle above; third segment of antenna four or more times the length of second..... 17

Midtibia with two or three median anterolateral bristles; third segment of antenna not over twice length of second..... 15

15. Front at vertex one-fourth head width in male; hypopygium with inner forceps long and tapering..... 16

Front at vertex less than one-fifth head width in male and barely more than one-fourth head width in female; hypopygium with tip of inner forceps curved backward, outer forceps about four-fifths length of inner forceps; 9-12..... 15. *epicydes* (Walker) (p. 92)

16. One reclinate prevertical bristle; black, gray-pollinose species; hypopygium with large inner forceps long, straight, and tapering, outer forceps wider, four-fifths length of inner forceps; 12 mm. (male only)

16. *imitator*, new species (p. 93)

Two reclinate prevertical bristles; black, subshining; very thinly gray-pollinose species; hypopygium with inner forceps similar to that of *imitator* but more concave on outer side and not a great deal longer than outer forceps; 8.5 mm. (male only)----- 17. *trichosomae*, new species (p. 94)

17. Scutellum black, the tip sometimes yellow; gena one-sixth to one-fifth eye height----- 18
 Scutellum yellow covered with gray pollen; gena one-tenth eye height; third segment of antenna six times length of second (male only)
cerurae, new species (p. 94)
18. Parafrontal and parafacial brassy, facial depression and posterior orbit silvery pollinose----- 19. pheosiae, new species (p. 95)
 Parafrontal and face gray-pruinose----- 20. fronto (Coquillett) (p. 96)

I. *APLOMYA SUBMISSA* (Aldrich and Webber), new combination

Zenillia submissa ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 31, 1924.

Collatia submissa (Aldrich and Webber) CURRAN, Families and genera of North American Diptera, p. 464, 1934.—TOWNSEND, Manual of myiology, pt. 4, p. 224, 1936.

Head with front at narrowest 0.15 to 0.16 head width; row of frontal bristles long, extending from below base of third antennal segment to three or four reclinate preverticals; facial ridge bristly on lowest one-fourth to one-third; gena one-tenth eye height; frontal orbit and face gray-pruinose; antenna black, third segment two and one-fourth times second; arista thickened on basal one-third, penultimate segment elongate; palpus black.

Thorax black, gray pollinose, marked with four mesonotal vittae; mid tibia with two median anterolateral bristles; hind tibia subciliate; wing hyaline, small crossvein infuscated, third vein with two or three bristles at base.

Abdomen black, gray pollinose; first and second segments with a pair and third with a row of marginal macrochaetae; fourth segment with marginal and submarginal bristles about three-fourths the length of the macrochaetae on third segment.

Length 7 mm.

Type locality.—Koehler, N. Mex.

Distribution.—New Mexico 1, Alberta 1.

Type.—Male, U.S.N.M. No. 25696.

Host.—Unknown.

Remarks.—Description based on the type male collected August 14, 1913 (Walton), and one male collected August 29, 1926, Cameron Lake, Alberta (King).

2. *APLOMYA CONFINIS* (Fallen) (genotype)

Tachina confinis FALLEN, Monographia muscidum sueciae, p. 32, 1820.—MEIGEN, Systematische Beschreibung der europäischen zweiflügeligen Insecten, vol. 4, pp. 274, 396, 1824.—ZETTERSTEDT, Insecta Lapponica, p. 644, 1838; Diptera Scandinaviae, vol. 3, p. 1140, 1844.

Aplomya confinis (Fallen) ROBINEAU-DESVOIDY, Mém. Acad. Sci. Inst. France, vol. 2, p. 184, 1830; Histoire naturelle des diptères des environs de Paris, vol. 1, p. 459-460, 1863.—COQUILLET, Proc. U. S. Nat. Mus., vol. 37, pp. 509, 553, 1910.—TOWNSEND, Manual of myiology, pt. 2, p. 60, 1935; pt. 4, p. 231, 1936.

Erorista confinis (Fallen) RONDANI, Dipterologiae Italicae prodromus, vol. 3, p. 143, 1859.—BEZZI and STEIN, Katalog der paläarktischen Dipteren, vol. 3, p. 241, 1907.—BAER, Zeitschr. Angew. Ent., vol. 7, p. 147 (113), 1921.—MÜLLER, Arch. Naturg., vol. 88, p. 125, pl. 111, 1922.—STEIN, Arch. Naturg., Abt. A, Heft. 6, p. 75, 1924.—THOMPSON, Ann. Parasitol., Humaine et Compar., vol. 4, p. 216, figs. 6, 18, 1926.—LUNDBECK, Diptera Danica, pt. 7, p. 312, 1927.—BARANOFF, Encycl. Ent. Diptera, vol. 4, p. 36, 1927.—WAINWRIGHT, Trans. Ent. Soc. London, 1928, p. 185.

The reason why this species has been commonly reported as occurring in North America is that it has been confused with *Aplomya theclarum*. Townsend has expressed the opinion that *A. confinis* does not occur in North America. The writer considers that this is another example of the resemblance of species between the Nearctic and Palearctic realms.

Admittedly there is a paucity of characters upon which the separation of *Aplomya confinis* and *A. theclarum* is based. Other than the difference cited in the key, there appear to be additional small differences between the two species. Owing to the scarcity of European specimens, it is difficult to evaluate the systematic worth of the noted differences.

Male with ten frontal bristles descending to middle of parafacials; facial ridge bristly one-fourth in male, one-fifth in female; gena one-seventh eye height in female; palpus black, brownish toward tip. Third vein with three bristles at base. A decidedly larger fly than *theclarum*.

Distribution.—Europe from middle Scandinavia and Finland down into Africa.

Hosts.—Bezzi and Stein, Baer, and Lundbeck list *Aporia crataegi* (Linnaeus); *Thecla ilicis* (Esper), *Zephyrus quercus* (Linnaeus), *Callophrys rubi* (Linnaeus), *Tephroclystia* sp., and *Rhyparia purpurata* (Linnaeus).

Remarks.—Comments based on an examination of one male collected on July 15 at Rambouillet, France, by Villeneuve, and one female collected at Kelenvoelgy, Hungary, September 6, 1927, by Muesebeck.

Lundbeck stated that the palpi of *confinis* were "yellow, brownish toward the base." Baer and Stein called the palpi of their specimens black.

The species is oviparous, depositing an oval egg, flattened below, on the skin of the host.

3. APLOMYA THECLARUM (Scudder), new combination

Tachina theclarum SCUDDER, Can. Ent., vol. 19, p. 166, 1887.

Erorista theclarum (Scudder) WILLISTON, Scudder's Butterflies of Eastern United States and Canada, vol. 3, p. 1920, fig. 17, 19, 1889.—TOWNSEND, Trans. Amer. Ent. Soc., vol. 22, p. 75, 1895; Psyche, vol. 7, p. 330, 1896.

Exorista chrysophani TOWNSEND, Ent. News, vol. 2, p. 197, 1891.

Exorista confinis of authors (nec Fallen) COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 97, 1897.—SMITH, Catalogue of New Jersey insects, p. 780, 1909.—REINHARD, Ent. News, vol. 32, p. 72, 1921.—GREENE, Proc. U. S. Nat. Mus., vol. 60, art. 10, p. 11, fig. 21 (puparium), 1922.

Zenillia confinis of authors (nec Fallen) ALDRICH and WEBER, Proc. U. S. Nat. Mus., vol. 63, pp. 35-36, 1924.—JOHNSON, List of New England Diptera, p. 197, 1925; Proc. Boston Soc. Nat. Hist., vol. 38, p. 87, 1925; Biological survey of Mount Desert, The insect fauna, pt. 1, p. 201, 1927.—ESSIG, Insects of western North America, p. 581, 1926.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.—REINHARD, Texas Agr. Exp. Stat. Bull. 401, pp. 33-34, 1929.—ALDRICH, Proc. U. S. Nat. Mus., vol. 80, art. 20, p. 2, 1932.

Head with front of male at narrowest 0.25 to 0.28 (in five specimens) and in female 0.31 to 0.33 (in five specimens) of head width; frontal row of six to eight bristles in male and five to six in female, extending from on a level with well below arista to two reclinate preverticals; male with very weak and female with outer vertical bristle; facial ridge bristly on lowest one-third in male, one-fourth in female; gena one-fifth to one-sixth eye height, silver-gray; parafacial and face silvery pollinose; antenna black, third segment in male four and one-half and in female three times length of second; arista thickened on basal one-half, penultimate segment elongate; palpus black, rarely partially yellow.

Thorax black, thinly gray pollinose in male, more noticeably pollinose in female; marked with five mesonotal vittae; midtibia usually with three median anterolateral bristles, the middle bristle longest, the lower one shortest, often very small in male; hind tibia subciliate; wing grayish hyaline, third vein with two bristles at base; squamae whitish.

Abdomen black and shining; first segment shining black; in male often obscurely rufous at the sides of second and third segments, second thinly gray pollinose with only a narrow hind margin and dorsal vitta black, third and fourth segments polished black with only a very narrow, interrupted silvery band at extreme base of third; in female, second segment with broader black hind margin and with pollinose band on third segment as broad as that on second, fourth segment wholly polished black except extreme base laterally; first segment with a pair, second often with four, and third with a row of marginal macrochaetae; no discal macrochaetae; fourth segment irregularly covered with bristles; abdominal hairs erect.

Hypopygium black, inner forceps shorter than outer, a few fine hairs on outer side, in profile decidedly concave on hind edge; outer forceps nearly straight, ending in a blunt point.

Length 5 to 8 mm.

Type locality.—Unknown.

Distribution.—Maine 1, New Hampshire 3, Massachusetts 11, Connecticut 1, New Jersey 3, Pennsylvania 1, Maryland 2, District of Columbia, Virginia 8, Louisiana 1, Indiana 1, Idaho 1, Colorado 1, New Mexico 3, Arizona 1, California 3, Ontario 1. Published and unpublished records not duplicated above: Maine (Johnson), New York 12 (West), New Jersey 6 (Smith), Kansas (Snow), Iowa (Townsend), Texas 9 (Reinhard), Colorado (Gillette), New Mexico (Cockerell), Arizona (Coquillett), Quebec (Winn and Beaulieu).

Cotype.—Male, U.S.N.M. No. 1421.

Hosts.—*Strymon calanus* Hübner 2, *Brephidium exilis* (Boisduval), 1, *Lycaena* sp. 1, lycaenid larva on *Sedum stenopetalum* 1, larva on apple 1. Published and unpublished records not duplicated above: *Lycaena dione* (Scudder) (Townsend), *Lycaena thoe* (Guérin-Ménéville) (Fletcher), *Plebeius melissa* (Edwards) (Gillette), *Brephidium exilis* (Boisduval) (Cockerell), *Strymon falacer* (Godart) (Scudder), *Lycaenopsis pseudargiolus* (Boisduval and LeConte) (Williston), Coquillett lists *Gloveria howardi* (Dyar) (Toumey) and *Lycaena xanthoides* (Boisduval) (Skinner), *Strymon melinus* Hübner (Reinhard).

Remarks.—The foregoing description was based on an examination of the following material: 2 male cotypes reared from *Strymon calanus*; 1 male bred from *Atriplex canescens* on which there were larvae of *Brephidium exilis* (Cockerell); 1 male, no. 3919, District of Columbia, May 24, 1886 (Pergande); 1 male from red lycaenid larva on *Sedum stenopetalum*, Boulder Canon, Colo., June (Cockerell); 1 male from larva on apple, Arlington, Mass., June 27, 1884 (Dimmock); and 186 collected specimens.

Adults, May to September. Adults have been taken on the flowers of *Ceanothus americanus* and *Tephrosia virginiana*.

4. *APLOMYA TRISSETOSA* (Coquillett), new combination

Exorista trisetosa COQUILLET, Proc. U. S. Nat. Mus., vol. 25, p. 110, 1902.

Zenillia trisetosa (Coquillett) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 29, 1924.

Frontal row of bristles extending from on a level below arista to one or two reclinate preverticals; frontals descending almost to meet bristles on facial ridge, which is bristly on lowest one-fourth to one-third; gena one-third eye height; parafrontal black, very thinly gray pollinose (side view), face gray pruinose, gena shining black below impression.

Thorax black, lightly covered with bluish-gray pollen; five mesonotal vittae; apical scutellars rather long, turned backward; midtibia with two or three median anterolateral bristles; hind tibia not ciliate; wing hyaline, third vein slightly sinuate, with three or four bristles at base.

Abdomen black, subshining, first segment black, remaining segments whitish pollinose at base; first segment with a weak pair, second with a pair, and third with a row of marginal macrochaetae; second and third segments with a pair of discal macrochaetae; fourth segment covered with macrochaetae.

Length 5 to 8 mm.

Type locality.—Moscow, Idaho.

Distribution.—Idaho 2, Montana 1, Colorado 3, Nevada 1, New Mexico 1, Washington 1, Pennsylvania 1. Published record, Illinois 1.

Type.—Male, U.S.N.M. No. 6212.

Hosts.—*Autographa californica* (Speyer) 1; *Loxostege commixtalis* (Walker) 2. Published record: Aldrich and Webber list, from Walton's manuscript, *Nephelodes emmedonia* (Cramer) (Kahl).

Remarks.—The material examined consisted of the male type, a male paratype, and a female paratype, August 26, 1895, Moscow, Idaho (Aldrich); 2 male paratypes, Lewiston, Idaho (Aldrich); one male ex *Autographa californica*, Edgar, Montana; one male ex *Loxostege commixtalis* (Maxson), Longmont, Colo., 1916; one male ex *L. commixtalis*, Fort Collins, Colo., July 30, 1932; collected specimens, six males and one female (Baker, Aldrich, Walton, Harbeck).

Adults, May to August.

5. *APLOMYA ESTIGMENENSIS*, new species

Exorista affinis of authors (nec Fallen) COQUILLETT, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, pp. 12, 94, 1897.—ADAMS, Williston's Manual of North American Diptera, p. 358, fig., 1908.—TOTHILL, Can. Ent., vol. 45, p. 70, 1913.

Zenillia affinis of authors (nec Fallen) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 34-35, 1924.—JOHNSON, List of New England Diptera, p. 197, 1925; Biological survey of Mount Desert region, The insect fauna, pt. 1, p. 201, 1927.—ESSIG, Insects of western North America, p. 581, 1926.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.—SCHAFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 111, 1934.

Tachina affinis (Aldrich and Webber) (nec Fallen), TOWNSEND, Manual of myiology, pt. 4, p. 212, 1936.

Male (type).—Head with front at narrowest 0.26 head width; frontal row of 11 or 12 bristles irregularly arranged, extending from on a level with well below arista to 2 reclinate preverticals; very weak outer vertical bristle; facial ridge bristly on lowest one-fourth; gena one-seventh eye height, blackish-gray pollinose; parafrontal and face silvery-black pollinose; antenna black, third segment twice length of second; arista thickened on basal one-fourth, penultimate segment elongate, at least as long as broad; palpus yellow.

Thorax black, subshining, thinly covered with gray pollen; five black mesonotal vittae; apical half of scutellum rufous, basal half black; apical scutellars strong, suberect; legs black, pulvilli long; midtibia

with four median anterolateral bristles, two inner ventral bristles; hind tibia unevenly ciliate; wing grayish hyaline, two bristles at base of third vein; squamae white.

Abdomen black, subshining, lightly covered with gray pollen; sides of second segment rufous; dorsum of first segment and a narrow posterior border on remaining segments shining black; when viewed from in front, thin layer of pollen more pronounced basally and laterally on dorsum of segments; first and second segments with a pair and third with a row of marginal macrochaetae; second and third segments with discal macrochaetae; irregularly arranged; fourth segment covered with erect bristles, some of bristles in discal area approaching one-half size of macrochaetae on third segment; abdominal hairs depressed on second segment, erect on third.

Length 8 mm.

Female (allotype).—Front of head at narrowest 0.28 head width; eight and nine frontal bristles, three preverticals; outer vertical bristle; gena one-eighth eye height; parafrontal silvery black, becoming blacker toward vertex; arista thickened on basal one-third. Thorax black, subshining, more noticeably pollinose than male. Abdomen black, subshining, more noticeably pollinose; dorsal vitta on basal half of second segment; second and third segments with one pair of roughly arranged discals and additional discal bristles.

Length 8 mm.

The paratype material varies from the descriptions as follows: Male front 0.24 and female front 0.28 to 0.31 head width; frontal bristles seven to nine, one male with three preverticals on one side, one female with only two preverticals, and one female with four; gena one-eighth eye height. Scutellum mostly rufous, black at base. Second and third segments with from one roughly arranged pair of discals to several discals more or less irregularly arranged.

Length 6 to 9 mm.

The puparia of *Aplomya estigmenensis* and *A. affinis* are alike in their major characteristics. The roughly triangular shaped stigmal plates are about flush with the surface of the puparium, and they are distinctly not protuberant; the three stigmal slits are plain, the bottom one nearly horizontal. There is a slight, crater-shaped, oval elevation at the base of the two stigmal plates which in *A. affinis* is distinctly wider in diameter than the distance between the two stigmal plates; whereas in *A. estigmenensis* this is smaller, the width of the diameter being about equal to the distance between the two plates. The stigmal plates of *A. affinis* are far above the longitudinal axis or subdorsally located, while in *A. estigmenensis* they are almost centered, being only slightly above. With the exception of the promi-

nence at the base of the stigmal plates, the puparia of *A. estigmenensis* are very similar to those of *Carelia reclinata* (Aldrich and Webber).

Type and allotype locality.—Hartford, Vt.

Distribution.—Maine 1, New Hampshire 3, Vermont 1, Massachusetts 7, Rhode Island 1, Montana 1, Colorado 2. Published records not duplicated above: Ontario 2 (Coquillett, Tothill); Aldrich lists Idaho 1, Utah 1, and Colorado 1; Minnesota (Washburn); Maine (Johnson); ? New York 2 (West).

Type.—Male, U.S.N.M. No. 54143.

Hosts.—*Estigmena acraea* (Drury) 5, *Phragmatobia fuliginosa rubricosa* Harris 7, *Isia isabella* (Abbot and Smith) 2, *Diacrisia virginica* (Fabricius) 1. Published records not duplicated above: *Phragmatobia fuliginosa* (Linnaeus) (Tothill), *Arctia* sp. (Coquillett).

Remarks.—The material examined consisted of 15 reared specimens bearing Gypsy Moth Laboratory note numbers. This included the type, allotype, and male paratype, No. 10046 B5; 2 female paratypes, Bangor, Maine, No. 10046 E19; 1 male and 2 female paratypes, Revere, Mass., Nos. 12140 B and B1. It also included 1 male and 4 female collected specimens (Aldrich, Hunter).

Practically all the differences between *Aplomya estigmenensis* and *A. affinis* are relative. Sixteen specimens collected at North Saugus, North Andover, and Melrose, Mass., favor to some extent the *A. affinis* characters. As these specimens apparently were collected at former liberation points of *Porthetria dispar* parasites, the writer offers the suggestion that there is a possibility that the European species might have been accidentally established in this country.

Adults, May to October; generations, two or three; number per host, one or two; hibernation, as larva in host larva.

6. *APLOMYA AFFINIS* (Fallen), new combination

Tachina affinis FALLEN, Svenska Vet.-Akad. Handl., vol. 31, p. 260, 1810; Monographia muscidum Sveciae, pp. 28, 57, 1820.—MEIGEN, Systematische Beschreibung der europäischen zweiflügeligen Insecten, vol. 4, pp. 327, 153, 1824.—ZETTERSTEDT, Diptera Scandinaviae, vol. 3, p. 1106, 1844.

Huebneria affinis (Fallen) ROBINEAU-DESVOIDY, Ann. Soc. Ent. France, 1847, p. 601; Histoire naturelle des diptères des environs de Paris, vol. 1, p. 279, 1863.—COQUILLETT, Proc. U. S. Nat. Mus., vol. 37, p. 553, 1910.—TOWNSEND, Manual of myiology, pt. 2, p. 60, 1935; pt. 4, pp. 209, 212, 1936.

Exorista polychaeta MACQUART, Ann. Soc. Ent. France, 1849, p. 380.

Exorista affinis (Fallen) MEIGEN, Systematische Beschreibung der europäischen zweiflügeligen Insecten, vol. 7, p. 255, 1838.—BEZZI and STEIN, Katalog der paläarktischen Dipteren, vol. 3, p. 239, 1907.—HOWARD and FISKE, U. S. Dept. Agr., Bur. Ent., Bull. 91, pp. 88-89, 1911.—BAER, Zeitschr. Angew. Ent., vol. 7, p. 147 (113), 1921.—STEIN, Arch. Naturg., Abt. A, Heft. 6, p. 72, 1924.—THOMPSON, Ann. Parasitol., Humaine et Compar., vol. 4, p. 212, figs. 9, 16, 1926.—LUNDBECK, Diptera Danica, pt. 7, p. 313, 1927.—WAINWRIGHT, Trans. Ent. Soc. London, 1928, p. 187.

No attempt is made to separate *Aplomya affinis* from *A. estigmenensis* in the key. This is another example of the resemblance of species between the Nearctic and Palearctic realms. The species *A. estigmenensis*, as represented by the type material, is distinct from *A. affinis* on both adult and puparial characters. There is, however, no proof that *A. affinis* does not occur in North America. Sixteen specimens collected at North Saugus, North Andover, and Melrose, Mass., former liberation points of gypsy moth parasites, favor to some extent the characters of *A. affinis*. The suggestion is offered that the European species might have been accidentally established in this country while gypsy moth parasites were being imported. The other possibility is that more Nearctic material may indicate a greater intergradation of the adult characters. *Arctia caja* (Linnaeus) and *Phragmatobia fuliginosa* (Linnaeus) have been reported as being Holarctic in their distribution. They are of doubtful Nearctic occurrence, as they are represented by varieties that do not occur in the Palearctic realm. The close resemblance of the hosts may have allowed for a closer parallel development of the parasites than in some of the other cases where similar superficial resemblance of the parasites has been noticed.

Male always with three and occasionally with four, female with three and usually additional reclinate prevertical bristles and hairs; frontal bristles consistently more numerous in the males. Fourth vein of wing with an indication of a fold or an appendage, usually with a very small stump, especially in the females. Abdomen as well as thorax more noticeably pollinose than in *Aplomya estigmenensis*; dorsal vitta present on second segment and obscurely indicated on segments 3 and 4, especially in males; usually but not always with four marginal macrochaetae on second segment; usually with several discal macrochaetae and bristles on second and third segments. Otherwise the description is much the same as for *A. estigmenensis*.

Distribution.—Europe, extending northward to southern Sweden and Finland.

Hosts.—The published host list is an extensive one. Baer and Lundbeck list (the first six are also listed by Bezzi and Stein): *Porthetria dispar* (Linnaeus), *Saturnia pavonia* (Linnaeus), *Pachytelia villosella* (Ochsenheimer), *Acrionicta alni* (Linnaeus), *Saturnia pyri* (Schifferrmüller), *Arctia caja* (Linnaeus), *A. hebe* (Linnaeus), *A. villica* (Linnaeus), *Vanessa urticae* (Linnaeus), *Orgyia gonostigma* (Fabricius), *Dasychira pudibunda* (Linnaeus), *Malacosoma neustria* (Linnaeus), *Dendrolimus pini* (Linnaeus), *Phragmatobia fuliginosa* (Linnaeus), *Acrionicta tridens* (Schifferrmüller), *Taeniocampa incerta* (Hufnagel) questionably listed by Baer, *Lymantria monacha* (Lin-

naeus) is questionably listed. Baer lists *Therapis evonymaria* (Schiffmüller). The species has been reared by the Bureau's former Central European Laboratory on *A. caja* 11, *A. hebe* 6, and various arctiid species 15.

Remarks.—The material examined consisted of 32 reared and 3 collected specimens from various localities in Hungary.

Ovoviviparous species depositing on the skin of the host; egg colorless, without pedicel, 0.71 by 0.24 mm.

With the exception of the prominence at the base of the stigmal plates, the puparia of *Aplomya affinis* are very similar to those of *Carcelia cheloniae* Rondani.

Superficially it is very easy, unless reasonable care is taken, to misidentify female specimens of *Carcelia cheloniae* as *Aplomya affinis*. It is suggested that perhaps *polychaeta* Macquart, instead of being a variety of *affinis* with four postsutural dorsocentral macrochaetae, is the same species as *cheloniae* Rondani. The writer has found this to be true, as females of *cheloniae* have been found with material determined as *affinis*. If this is true then *Exorista polychaeta* Macquart equals *Exorista cheloniae* Rondani.

7. APLOMYA SETINERVIS (Coquillett), new combination

Exorista setinervis COQUILLET, Proc. Ent. Soc. Washington, vol. 12, p. 129, 1910.
Zenillia setinervis (Coquillett) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 26, 1924.

Head with front of male at narrowest 0.23 and in female 0.27 head width; frontal row of eight bristles in male and five in female, extending from on a level with base of third antennal segment to two reclinate preverticals, widely separated, the first stronger than the second; facial ridge bristly on lowest one-third; gena one-sixth eye height; parafrontal and face silvery pollinose; third antennal segment in male more than four and in female four times second; arista thickened on basal one-fifth, penultimate segment short.

Thorax black, gray pollinose, marked with four mesonotal vittae; hind tibia not ciliate; pulvilli ashy color, long in male, short in female.

Abdomen shining black and polished, excepting the narrow bases of second and third segments, which are bluish-white pruinose.

Length 6 mm.

Type locality.—Clarksburg, Tenn.

Distribution.—Tennessee 1, North Carolina 1.

Type.—Male, U.S.N.M. No. 13097.

Host.—Unknown.

Remarks.—Description based on an examination of the collected type male (Morgan) and a collected female, Raleigh, N. C. (Sherman).

8. *APLOMYA CRASSISETA* (Aldrich and Webber), new combination

Zenillia crassiseta ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 29, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.

Head with front of male at narrowest 0.23 to 0.24 and in female 0.28 head width; frontal row of eight or nine bristles in male and five to six in female, extending from slightly below junction of the second and third antennal segments in male and slightly above in female to two strong reclinate preverticals; parafrontal of male varying from golden pollinose to slightly brassy pollinose, in the female grayish pollinose without a conspicuous brassy tinge (allotype female with a brassy tinge); facial ridge bristly on lowest one-sixth; gena one-seventh to one-sixth eye height; face, parafacials, and posterior orbits silver-gray pollinose, face in two males slightly tinged with gold; antenna black, third segment in male about two and one-half and in female twice second; arista thickened on basal one-fourth to one-third, penultimate segment short.

Thorax black, dusted lightly with a gray pollen, sometimes with a yellow tinge; five mesonotal vittae; male type with three postsutural dorsocentral macrochaetae, the remainder with four; midtibia with two or three median anterolateral bristles; hind tibia unevenly ciliate, with one longer bristle; wing grayish hyaline tinged with brown; third vein with two bristles at base; squamae white.

Abdomen black; in male second and third segments on basal two-thirds and fourth on basal one-half, in female second and third segments on basal one-fifth and fourth on basal one-third densely light-gray-silvery pollinose; remainder, including dorsal vitta on second segment, shining black; first segment with one pair, second with two pairs, third and fourth with a row of marginal macrochaetae; second and third segments with one pair and fourth segment with at least one row of discal macrochaetae, in one female the discals on second and third segments weak; abdominal hairs suberect in male, depressed in female.

Length 7 to 9 mm.

Type locality.—Lafayette, Ind.

Distribution.—Indiana 1, Massachusetts 1, New Jersey 1.

Type.—Male, U.S.N.M. No. 25695.

Host.—Unknown.

Remarks.—Description based on an examination of the type male, August 31, 1917 (Aldrich); allotype female and paratype male, North Andover, Mass., July 11, 1916 (H. E. Smith); and two males and one female, Somerville, N. J., May 22, 1922 (Webber). The front of the last three specimens are less golden-pollinose, but a survey of the

characters including the genitalia shows a very close resemblance to the paratype male.

9. *APLOMYA NEUROTOMAE*, new species

This species resembles to some extent both *Aplomya fronto* Coquillett and *A. caesar* Aldrich.

Male (type).—Head with front at narrowest 0.29 head width; frontal row of bristles extending from on a level with a little below base of third antennal segment to three strong reclinate upper frontals on one side and two strong and one weak on other; no small hairs on upper part of parafacial directly below lowest frontals; facial ridge bristly on lowest two-fifths; gena one-sixth eye height; parafacial, face, gena, and posterior orbit with light-gray, silvery pollen, parafacial slightly blackish on upper part toward vertex; antenna black, third segment four and one-half times as long as second.

Thorax shining black covered with gray pollen, marked by five mesonotal vittae; black scutellum covered with gray pollen except on basal one-fourth, with a pair of discal scutellars; hind tibia ciliate, with one long bristle near middle; wing grayish hyaline; third vein with three and four bristles at base; squamae white.

Abdomen shining black, second to fourth segments silvery-gray pollinose except narrow posterior borders and a dorsal vitta, which are shining black; sides of second abdominal segment faintly reddish underneath the pollen; second and third segments with a pair of discal macrochaetae; first and second segments with a pair and third with a row of marginal macrochaetae; fourth segment with a discal row and tipped with marginal bristles.

Length 8 mm.

Female (allotype).—Front at narrowest part 0.30 head width; two reclinate upper frontals; two pairs of fronto-orbital bristles; third segment of antenna slightly less than four times second. Pulvilli one-half length of those of male; third vein of wing with two bristles at base. Dorsal ground color of abdomen black; venter and sides yellow, on second and third segments extending up on dorsum somewhat; pollen pattern as in male.

Length 7 mm.

The paratype material varies as follows: Males with from two to three reclinate preverticals, usually two, females with only two; in one specimen of each sex frontal bristles descending only to junction of second and third antennal segments; facial ridge bristly from one-third to one-half; gena varying from one-eighth to one-sixth, usually one-sixth; arista varying but usually thickened on basal one-third; palpi of three females tipped with yellow. Two males have the scutellum tipped with yellow; one male, three dorsocentrals on one

side; two males, four sternopleurals on one side; third vein with from two to five bristles at base, usually two. Color of male abdomen usually black, two having a reddish spot on sides of second segment, one male colored as in female except that the fourth segment is black; one specimen of each sex lacks discal macrochaetae on the second and third segments, the female having only a widely separated pair of marginals on the third segment; in some specimens only one of the usual pair of discal macrochaetae is present.

Length 6 to 8 mm.

Type locality.—Clinton, N. J.

Distribution.—New Hampshire 1, Massachusetts 2, Connecticut 2, Rhode Island 1, New Jersey 14, Pennsylvania 2.

Type.—Male, U.S.N.M. No. 54148.

Host.—*Neurotoma fasciata* (Norton) 66.

Remarks.—The material examined consisted of 66 reared specimens bearing Gypsy Moth Laboratory note numbers. Included are the type and 2 male and 1 female paratypes No. 11733 N5; allotype, Mason, N. H., 12111 H2; 1 male paratype, Revere, Mass., No. 12111 F1c; 1 male and 2 female paratypes, Somerville, N. J., No. 11733 K1, L1; 1 female paratype, Piscataway, N. J., No. 11733 L2; 1 male paratype, Patterson, N. J., No. 12111 L2; 1 male paratype, Hackettstown, N. J., No. 11733 N3; 1 female paratype, Lebanon, N. J., No. 11733 N4; 1 female paratype, New Milford, Pa., No. 12111 P3; 1 male and 1 female paratypes, Doylestown, Pa., No. 12111 R1.

Three females had yellow palpi. Although the palpi are usually black, especially so in the males, other specimens of both sexes show gradations between yellow and black. The female palpi are lighter in color than in the male, sometimes with the tip yellow. When the palpi are yellow the bases are strongly infuscated.

Adults, May to September; generations, one or two.

10. *APLOMYA CONFUSIONIS*, new species

Exorista nigripalpis TOWNSEND (nec Macquart, 1846), *Psyche*, vol. 7, p. 330, 1896.

Exorista nigripalpis AINSLIE (nec Townsend), *Journ. Agr. Res.*, vol. 24, p. 411, 1923; U. S. Dept. Agr. Tech. Bull. 31, p. 14, 1927.

Zenillia caesar (Aldrich) ALDRICH and WEBBER (partim), *Proc. U. S. Nat. Mus.*, vol. 63, art. 17, p. 28, 1924.

It is possible that instead of *Exorista caesar* Aldrich this species may be the same as *E. nigripalpis* Townsend. In any case *nigripalpis* is preoccupied by *Exorista nigripalpis* Macquart, 1846.

Male (type).—Head with front at narrowest 0.26 head width; frontal row of eight bristles, extending from on a level with base of third antennal segment to two reclinate preverticals; facial ridge bristly on lowest one-fourth; gena about one-sixth eye height; parafrontal, face, and gena silvery pollinose, parafrontal slightly blackish on upper part

toward vertex; antenna black, third segment three and one-half times as long as second.

Thorax shining black, thinly gray pollinose, marked by five mesonotal vittae; black scutellum with a pair of weak discal scutellars; midtibia with three median anterolateral bristles; hind tibia unevenly ciliate; third vein with two bristles at base.

Abdomen, including dorsal vitta, shining black all except a very narrow basal border on segments 2, 3, and 4, which are grayish pollinose; pollen confined more to base and sides of segments (fourth segment appearing to be almost without pollen in some specimens); first and second segments with a pair, and third with a row, of marginal macrochaetae; fourth segment with marginal and submarginal bristles.

Female (allotype).—Front at narrowest 0.28 head width; seven frontal bristles, three reclinate preverticals; gena one-eighth eye height; third segment of antenna twice as long as second. Midtibia with two median anterolateral bristles; pulvilli one-half length of male pulvilli.

The paratype material varies as follows: Front in male 0.26 to 0.27, in female 0.28 to 0.30, head width; male with from seven to nine frontal bristles, female usually with seven, usually two reclinate preverticals; facial ridge bristly on lowest one-fifth to one-fourth; gena usually one-eighth eye height, some female palpi brownish. One female with four sternopleural macrochaetae on one side; discal scutellars usually present, two males lacking them; mid tibia usually with two median anterolateral bristles.

Type and allotype locality.—Franconia, N. H.

Distribution.—New Hampshire 3, Massachusetts 3, Colorado 1, District of Columbia 1, Indiana 1, Idaho 1, Wyoming 1, Nevada 1, Washington 1.

Type.—Male, U.S.N.M. No. 54142.

Host.—*Crambus trisectus* (Walker) 5. Published record: *Crambus mutabilis* Clemens (Ainslie).

Remarks.—The material examined consisted of the type and one male paratype collected July 30, 1915 (Townsend); the allotype and four male paratypes, July 31, 1915 (Townsend); two male paratypes, Fabyans, N. H., August 19, 1914 (Townsend); two female paratypes, Mt. Holyoke Gap, Mass., September 18, 22, 1914 (Townsend); one female paratype, Washington, D. C., May 19, 1927; one female paratype, Tennessee Pass, Colo., July 11, 10,240 ft. (Aldrich); one female paratype, Lafayette, Ind., August 24, 1920. Exp. 20238 (Blum); one female paratype ex *Crambus trisectus* (Walker), Lafayette, Ind., Knoxville No. 2040 (Larrimer); four males ex *C. trisectus* (Larrimer); one male and one female, June 21, 1888, No. 3679^o; one male and three females collected in various places by Townsend, Aldrich, Morrison.

Webber, Allen, and Baker. One male collected at Potlatch, Idaho, July 27, 1927 (Aldrich), may possibly be distinct from this species. This male has all pollen tinged with gold, the abdomen excepted, the body hairs of thorax and abdomen much longer, and the frons not much deeper golden than the type and other specimens.

11. *APLOMYA CAESAR* (Aldrich), new combination

- Ecorista nigripalpis* TOWNSEND (nec Macquart, 1846), Psyche, vol. 7, p. 330, 1896.—COQUILLETT, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 93, 1897.—TOTHILL, Can. Ent., vol. 45, p. 71, 1913; Ottawa Nat., vol. 28, p. 114, 1914.—GIBSON, Ann. Rep. Ontario Ent. Soc., 1918, p. 117.—GREENE, Proc. U. S. Nat. Mus., vol. 60, art. 10, p. 11, fig. 83 (puparium), 1922.—HUBER and NEISWANDER, Journ. Econ. Ent., vol. 17, p. 127, 1924.
- Erorista caesar* ALDRICH, Can. Ent., vol. 48, p. 20, 1916.—CAESAR, Ann. Rep. Ontario Ent. Soc. 1916, p. 173.—SPENCER and CRAWFORD, Ontario Dept. Agr. Bull. 295, p. 7, 1923.
- Zenillia caesar* (Aldrich) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 28-29, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925; Biological survey of Mount Desert, The insect fauna, pt. 1, p. 201, 1927.—ESSIG, Insects of Western North America, p. 581, 1926.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.

This species has been considered to be synonymous with *Aplomya mitis* Meigen, an introduced parasite of the European corn borer. This is another example of the resemblance of species between the Nearctic and Palearctic realms. The characters used to separate these two species are more or less relative in value, but, if carefully used, they will be found to be satisfactory.

Frontal row of eight to ten bristles in male and six to eight in female, extending from on a level with base of third antennal segment to one reclinate prevertical; facial ridge bristly on lowest one-fourth in male, lowest one-sixth in female; gena one-sixth eye height; antenna black; palpus black.

Thorax black, thinly gray-pollinose in male, more noticeably pollinose in female, with a bluish tinge; marked with five mesonotal vittae, the three median vittae very prominent before the suture and abbreviated behind; disk of scutellum covered with erect hairs, usual pair of discal scutellars lacking; hind tibia not ciliate; wing grayish hyaline, third vein with two bristles at base; squamae white.

Abdomen black, gray-pollinose (more noticeably so in female) with a bluish tinge; second to fourth segments pollinose on basal two-thirds, varying from thinly gray pollinose to a heavier silver-gray pollinose laterally and basally; first segment, posterior one-third of segments two to four, and dorsal vitta shining black; abdominal hairs suberect in male, depressed in female; first and second segments with a pair and third with a row of marginal marochaetae; fourth segment rather irregularly tipped with marginal and sub-

marginal bristles that almost approach the macrochaetae in size, in the female the marginal bristles not at all developed.

Length 5 to 7 mm.

Type locality.—Simcoe, Ontario.

Distribution.—New Hampshire 1, Massachusetts 11, Connecticut 2, New York 4, Michigan 3, Indiana 1, Illinois 1, Montana 1, Idaho 4, Washington 1, Colorado 3, Arizona 1, New Mexico 2, Quebec 3, Ontario 1. Published and unpublished records not duplicated above: New York 9 (West) 1 (Aldrich), Ohio 1 (Huber and Neiswander), Alberta 1 (Gibson). Coquillett lists New Hampshire 1, District of Columbia, California 1, and Ontario 1.

Type.—Male, Canadian National Museum. Paratypes (of *caesar*), U.S.N.M. No. 25694. The type of *nigripalpis* is in the University of Kansas.

Hosts.—*Archips argyrosipila* (Walker) 20, *Archips fumiferana* (Clemens) 4, *Archips semifera* (Walker) 3, *Archips purpurana* (Clemens) 1, *Archips parallela* (Robinson) 1, *Nygmia phaeorrhoea* (Donovan) 1, *Pyrausta nubilalis* (Hübner) 17, *P. penitalis* (Grote) 9, *P. ainsliei* (Heinrich) 2, *Loxostege commixtalis* (Walker) 2, *Loxostege sticticalis* (Linnaeus) 1, *Papaipema nitela* (Guénée) 1. Published records not duplicated above: *P. nubilalis* (Huber and Neiswander).

Remarks.—The foregoing description is based on an examination of the following material: 2 male paratypes, 1 female paratype, and 1 male reared from *Archips argyrosipila*, Simcoe, Ontario (Caesar); 7 males and 5 females reared from *A. argyrosipila*, Canyon City, Colo. (Gill); 1 female ex *A. argyrosipila*, Darby, Mont. (Regan); 1 female ex *A. argyrosipila*, Wenatchee, Wash. (Newcomer); 12 specimens bearing Gypsy Moth Laboratory note numbers; 1 male ex *Loxostege sticticalis*, Greeley, Colo. (Mallory); 1 male and 1 female ex *L. commixtalis*, Fort Collins, Colo.; 9 males and 8 females ex *Pyrausta nubilalis* (Corn Borer Laboratory); 5 males and 4 females ex *P. penitalis* (Corn Borer Laboratory); 1 male and 1 female ex *P. ainsliei* (Corn Borer Laboratory); 7 males and 9 females, collected specimens (Aldrich, Townsend, Piper, Walton, and Mosher).

One male collected on Harvey Ranch, altitude 10,000 feet, Pecos National Forest, August 16 (Townsend). A much darker species with a bluish cast, the frons bluish black. It is probably a distinct species.

The material reared from *Pyrausta* as characterized by the tawny or brassy tinge to the parafrontals seems to be slightly different from the material reared from *Archips*. On most of the characters, however, they appear to be very much alike. The description is based mostly on the material secured from the various species of *Archips*.

Adults, June to September; generations, probably two; hibernation, as larva in most larva.

12. *APLOMYA MITIS* (Meigen), new combination

Tachina mitis MEIGEN, Systematische Beschreibung der europäischen zweiflügeligen Insecten, vol. 4, p. 335, 165, 1824; vol. 7, p. 256, 16, 1838.

Paraxorista mitis (Meign) BRAUER and BERGENSTAMM, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 58, pp. 319, 325, 1891.

Exorista mitis (Meigen) SCHINER, Fauna Austriaca, Die Fliegen, vol. 1, p. 467, 1862.—BEZZI and STEIN, Katalog der paläarktischen Dipteren, vol. 3, p. 244, 1907.—BAER, Zeitschr. Angew. Ent., vol. 7, p. 147 (113), 1921.—STEIN, Arch. Naturg., Abt. A, Heft 6, pp. 68, 78, 1924.—LUNDBECK, Diptera Danica, pt. 7, p. 320, 1927.

This species has been introduced into the United States in small numbers as a parasite of the European corn borer. As *Aplomya caesar* (Aldrich) has been considered to be a synonym of *A. mitis* (Meigen), it has previously been impossible to state definitely whether *A. mitis* has actually been established in this country. All the known differences between *A. caesar* and *A. mitis* are cited in the key to the species.

Distribution.—Widely distributed in Europe from France to northern Sweden. The species is not common.

Hosts.—*Pyrausta nubilalis* (Hübner) 12. Published record: *Calymnia trapezina* (Linnaeus) (Bezzi and Stein, Baer).

Remarks.—The differences cited are based on an examination of three males and two females from Paris, France (Parker), furnished by the European Corn Borer Laboratory, Toledo, Ohio; and four males and three females from Lille, France (Thompson), bearing numbers IN. 1.24–2.12, ser. 271, Webster no. 18818, reared from bulk collections of European corn borer.

On the basis of the small amount of material examined, the writer is unable to state whether *Aplomya mitis* is established in the United States. The material examined that was reared in the United States from *Pyrausta nubilalis*, *P. penitalis*, and *P. ainsliei* was all referred to *Aplomya caesar* (Aldrich).

Commencing in 1928, *Aplomya mitis* has been liberated in small numbers in 19 localities in the following States: Massachusetts 5, Connecticut 1, Rhode Island 2, New York 4, Pennsylvania 1, Ohio 3, Indiana 1, and Michigan 2. Information supplied by the European Corn Borer Laboratory, Toledo, Ohio.

13. *APLOMYA POLITA* (Coquillett), new combination

Exorista polita COQUILLET, U. S. Dept. Agr. Div. Ent., Tech. Bull. 7, p. 99, 1897.
Zenillia polita (Coquillett) ALDRICH and WEBBER, U. S. Nat. Mus., vol. 63, art. 17, p. 25, 1924.

Head with front at narrowest 0.26 head width; frontal row of bristles extending from on a level below base of third antennal segment to three reclinate preverticals; facial ridge bristly on lowest one-fourth; gena one-eighth eye height; face silvery pruinose; third

segment of antenna five times length of second; arista hardly thickened on basal one-fourth, penultimate segment short.

Thorax marked with four mesonotal vittae; scutellum black; hind tibia ciliate.

Abdomen shining black, narrow bases of segments 2 and 3 white-pollinose, abdominal hairs rather long and suberect.

Length 7 mm.

Type locality.—Tifton, Ga.

Type.—Male, U.S.N.M. No. 3598.

Host.—Unknown.

Remarks.—Redescribed from type specimen.

14. *APLOMYA HELVINA* (Coquillett), new combination

Exorista helvina COQUILLET, U. S. Dept. Agr., Div. Ent. Tech. Bull. 7, p. 96, 1897.—SLOSSON, Ent. News, vol. 9, p. 252, 1898.—SMITH, Catalogue of New Jersey insects, p. 672, 1899; p. 780, 1909.—TOTHILL, Can. Ent. vol. 45, p. 71, 1913.

Zenillia helvina (Coquillett) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 15-16, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925; Biological survey of the Mount Desert region, The insect fauna, pt. 1, p. 201, 1927.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.—SCHAFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 112, 1934.—PROCTER, Biological survey of the Mount Desert region, The insect fauna, pt. 6, p. 374, 1938.

Huebneria helvina (Coquillett) TOWNSEND, Manual of myiology, pt. 4, p. 212, 1936.

Head with front of male at narrowest 0.27 to 0.29 and in female 0.30 to 0.33 head width; frontal row of six to eight bristles, extending from on a level with base of third antennal segment to two reclinate preverticals; facial ridge bristly on lowest one-fifth; gena one-sixth to one-fifth eye height; face and gena light-gray-silver pollinose; antenna with third segment black, first and second segments varying from rufous to black but usually rufous, third segment in male four and one-half and in female three and one-half times the second; arista thickened on basal one-fourth, penultimate segment short.

Thorax black, dorsum densely covered with golden pollen, sides and venter gray pollinose; five mesonotal vittae; scutellum black covered with dense golden pollen; mid tibia with one or two, usually two, median anterolateral bristles, one long bristle in middle and a shorter one above it which was consistently longer in female than in male; hind tibia unevenly ciliate; third vein with three or four bristles at base; squamae white.

Abdomen black, dorsum entirely covered with dense golden pollen, venter silvery pollinose, sometimes with a slight brassy tinge; first and second segments with a pair and third with a row of marginal macrochaetae; fourth segment tipped with marginal and submarginal bristles more or less irregularly placed.

Length 6 to 9 mm.

Type locality.—White Mountains, N. H.

Distribution.—Maine 13, New Hampshire 3, Massachusetts 3, New York 3, New Jersey 1, Pennsylvania 1, Washington 1. Published records not duplicated above: Maine (Johnson, Procter), New York 5 (West), New Jersey 4 (Smith), Connecticut (Schaffner and Griswold), British Columbia (Tothill).

Type.—Male, U.S.N.M. No. 3624.

Hosts.—*Lycia cognataria* (Guénéé) 52. Published records not duplicated above: *Lycia cognataria* (Tothill, Johnson), *Nacophora quernaria* (Abbot and Smith) (Schaffner and Griswold), unidentified Geometridae (Schaffner and Griswold).

Remarks.—The foregoing description was based on an examination of the following material: type male with discals on the third segment (Morrison); 52 reared specimens bearing Gypsy Moth Laboratory note numbers; five males and five females collected in various places by Slosson, Townsend, Aldrich, and Walton (all but one of the collected specimens had discals on the third abdominal segment).

Adults, June to August; generations, one; number per host, one; hibernation, in the puparium. There was a macrotype egg jutting from the ovipositor of one of the collected females.

15. *APLOMYA EPICYDES* (Walker), new combination

Tachina epicydes WALKER, List of the specimens of dipterous insects in the collection of the British Museum, pt. 4, p. 786, 1849.

Exorista affinis (Fallen) COQUILLET (partim), U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 94, 1897.

Exorista epicydes (Walker) AUSTEN, Ann. Mag. Nat. Hist., ser. 7, vol. 19, p. 336, 1907.

Zenillia coerulea ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 23, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925.

Zenillia epicydes (Walker) ALDRICH, Proc. U. S. Nat. Mus., vol. 80, art. 10, p. 10, 1931.

Head with front in male at narrowest 0.17 to 0.19 and in female 0.26 to 0.28 of head width; frontal row of 10 to 13 bristles in male and 7 to 11 in female extending from on a level with base of third antennal segment to two reclinate preverticals; facial ridge bristly on lowest one-fourth; genae about one-seventh eye height; parafacial, face, and gena silvery pollinose with a blackish tinge; third segment of antenna from one and three-fourths to twice second; arista thickened on basal one-third, penultimate segment short.

Thorax black covered with gray pollen with a slight bluish tinge, five black mesonotal vittae; scutellum varying from yellow to black, densely covered with silvery-gray pollen; legs black; midtibia with two median anterolateral bristles in male and three in female; hind tibia unevenly ciliate; wing hyaline, bend of last section of

fourth vein a little rounded, hind cross vein curved, third vein usually with two bristles at base; squamae white.

Abdomen black, gray-pollinose, dorsum of first segment, narrow apical margins of second and third, tip of fourth, and dorsal vitta shining black; gray pollen interrupted by irregular black areas that shift when viewed in different lights; discal portions of second and third segments bearing erect bristles that at times approach macrochaetae in size, often some of larger ones more or less regularly placed, giving appearance of discal macrochaetae; first segment with one pair, second with two pairs, and third with a marginal row of macrochaetae; fourth segment covered with erect bristles about one-half size of macrochaetae on third segment.

Length 9 to 12 mm.

Type locality.—Martin Falls, Albany River, Canada.

Distribution.—Maine 2, New Hampshire 1, Vermont 1, Massachusetts 4, Rhode Island 1.

Type.—Male, British Museum.

Host.—*Cimex americana* Leach 14.

Remarks.—The foregoing description was based on an examination of 14 reared specimens bearing Gypsy Moth Laboratory note numbers including female type and female paratype (No. 10039 E10) of *Zenillia coerulea* Aldrich and Webber, U.S.N.M. No. 2574.

Adults, June and July; generations, one; number per host, one to four: hibernation, in puparium.

16. APLOMYA IMITATOR, new species

Male (type).—Frontal row of 13 bristles, extending from on a level with base of third antennal segment to 1 reclinate prevertical; facial ridge bristly on the lowest one-fourth; gena one-fifth eye height; parafacial smoky-gray pollinose; third segment of antenna one and three-fourths times second (wider than in *epicydes*); arista thickened on basal one-fifth, penultimate segment short.

Thorax black, gray-pollinose; scutellum black; midtibia with three median anterolateral bristles; hind tibia not ciliate; third vein of wing with one bristle at base; squamae white.

Abdomen black, gray-pollinose; first segment shining black; discal bristles on second and third segments, some approaching size of macrochaetae; first segment with a pair, second with two pairs, and third with a row of marginal macrochaetae; fourth segment irregularly bristly.

Type locality.—Lillooet, British Columbia.

Type.—Male, U.S.N.M. No. 54144.

Remarks.—Description based on type male collected May 7, 1918, by A. B. Baird.

17. *APLOMYA TRICHIOSOMAE*, new species

Male (type).—Frontal row of 10 bristles, extending from on a level with base of third antennal segment to 2 reclinate preverticals; facial ridge bristly on the lowest one-fourth; gena one-eighth eye height; parafrontal, face, and gena silvery black (much blacker than in *epicydes*); third segment of antenna little more than twice second (wider than in *epicydes*), third segment having a swollen appearance when viewed from above; arista thickened on basal one-third, penultimate segment short.

Thorax black, subshining, very lightly covered with gray pollen; five black mesonotal vittae; scutellum shining black, so lightly covered with gray pollen that the black is hardly noticeable; legs black; midtibia with two long, median, anterolateral bristles on one side and three on other; hind tibia unevenly ciliate; wing hyaline, bend of last section of fourth vein forming an obtuse angle, hind cross vein straight, third vein with two bristles at base; squamae white.

Abdomen shining black, silver-gray pollen confined to a narrow basal border dorsally on second, third, and fourth segments, broadening out to cover greater part of sides and venter of segments; discal portions of second and third segments bearing erect bristles; first segment with a pair, second with two pairs, and third with a marginal row of macrochaetae; fourth segment covered with erect bristles about one-half size of macrochaetae on third segment.

Length 8.5 mm.

Type locality.—Greenville, Maine.

Type.—Male, U.S.N.M. No. 54145.

Host.—*Trichiosoma* sp.

Remarks.—Described from one male bearing Gypsy Moth Laboratory note number 10088 N11 recovered June 4, 1928, from three larvae collected September 14, 1927.

18. *APLOMYA CERURAE*, new species

Zenillia n. sp. (3) SCHAFFNER and GRISWOLD. U. S. Dept. Agr. Misc. Publ. 188, p. 113, 1934.

Male (type).—Head with front at the narrowest 0.24 head width; frontal vitta brown, slightly less than one-third width of front; frontal row of nine bristles, extending from base of third antennal joint to two reclinate preverticals; parafrontal blackish gray-pollinose, black more predominant toward vertex; facial ridge bristly on lowest one-third; face silvery and gena gray-pollinose; antenna black, third segment six times length of second; arista thickened on basal two-fifths, penultimate segment short.

Thorax black, with a very slight bluish tinge, covered with grayish pollen; five black mesonotal vittae; midtibia with one long median

anterolateral bristle; hind tibia ciliate, with one longer bristle; wing grayish hyaline; third vein with two bristles at base; squamae white.

Abdomen shining black, light-gray pollinose except posterior borders and dorsal vitta, which are shining black; discal portions of second, third, and fourth segments covered with irregularly placed, erect bristles that approach the macrochaetae in size; first and second segments with one pair and third and fourth with a row of marginal macrochaetae.

Length 8 mm.

One male paratype differs from the type in having one smaller bristle above one long, median, anterolateral bristle; only two sternopleural macrochaetae on one side.

Length 8 mm.

Type locality.—Melrose, Mass.

Type.—Male, U.S.N.M. No. 54146.

Host.—*Cerura cinerea* Walker 2.

Remarks.—The material examined consisted of type and one paratype male bearing Gypsy Moth Laboratory note number 12164 P 119. Adults issued June 5 and 10, 1929, secured from one larva collected August 20, 1928. An additional three puparia from the same larva failed to produce adults.

19. *APLOMYA PHEOSIAE*, new species

Zenillia n. sp. (5) SCHAFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 114, 1934.

Male (type).—Head at narrowest 0.20 head width; frontal vitta brown, one-third width of front; frontal row of 11 bristles, extending from on a level with base of third antennal segment to one reclinate prevertical; facial ridge bristly on lowest two-fifths; gena one-fifth eye height, gray-pollinose; parafacial and parafacial brassy, facial depression and posterior orbit silvery pollinose; antenna black, third segment four times as long as second; arista thickened on basal one-fourth, penultimate segment short.

Thorax shining black, lightly covered with gray pollen; five black mesonotal vittae; scutellum black covered with gray pollen; midtibia with one long median anterolateral bristle; wing grayish hyaline, third vein with one bristle at the base; squamae white.

Abdomen shining black, second to fourth segments light-gray-pollinose except posterior margin and a dorsal vitta, which are shining black; second and third segments with a few erect bristles and discal macrochaetae a little irregularly placed; first and second segments with a pair and third with a row of marginal macrochaetae; fourth segment irregularly tipped with marginal and submarginal macrochaetae.

Length 8 mm.

Female (allotype).—Front at narrowest 0.30 head width; two reclinate preverticals; two pairs of fronto-orbital bristles; facial ridge bristly on lowest one-third. Mittibia with one long, median, anterolateral bristle and one short one above it; pulvilli one-half length of those of male.

Length 7 mm.

The paratype material varies from the type description as follows: Reclinate preverticals varying from one to two; gena from one-sixth to one-fifth eye height. Scutellum usually black but three males with tip yellow; only one male and all but two females having one long, median, anterolateral bristle with a shorter one above it; third vein with either one or two bristles at base.

Length 6 to 9 mm.

Type and allotype localities.—Moose River Plantation, Maine.

Distribution.—Maine 5, Massachusetts 1. Recorded but not duplicated above: Maine 9, Massachusetts 1.

Type.—Male, U.S.N.M. No. 54147.

Host.—*Pheosia dimidiata* (Herrich-Schaeffer) 18; *Alypia octomaculata* (Fabricius) 1.

Remarks.—The material examined consisted of 19 reared specimens bearing Gypsy Moth Laboratory note numbers. This included the type, the allotype, and 3 male and 1 female paratype, No. 12198 M1; 1 male paratype, Alton, Maine, No. 12198 J3a; 1 male and 3 female paratypes, Sandy Bay Plantation, Maine, No. 12198 N4; 2 male paratypes, West Forks, Maine, No. 12198 N8; 2 female paratypes, Lily Bay, Maine, No. 12198 N16.

Adults, June and July; generations, one; number per host, one to eight; hibernation, in the puparium.

20. *APLOMYA FRONTO* (Coquillett), new combination

Erorista fronto COQUILLET, U. S. Dept. Agr., Div. Ent., Bull. 7, p. 96, 1897.

Zenillia fronto (Coquillett) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 36, 1924.—JOHNSON, List of New England Diptera, 1925.

Head with front in male and female about same, 0.32 head width; row of seven or eight frontal bristles, extending from on a level with a little below base of third antennal segment to two reclinate preverticals; facial ridge bristly on the lowest two-fifths to one-half; gena one-sixth eye height; parafrontal, face, and gena silvery-gray pollinose; antenna black, third segment of male five and three-fourths and of female four and one-fourth times the second; arista thickened on basal one-third, penultimate segment short; palpus completely yellow.

Thorax black, gray-pollinose; marked by five mesonotal vittae; type male lacking a pair of discal scutellar bristles; femora and

tibiae reddish in male, yellowish in female; hind tibia ciliate; pulvilli longer in male; wing grayish hyaline with a brownish tinge, third vein with two to three bristles at base.

Abdomen black, gray-pollinose; side of segments 1 and 2 in male reddish; venter and sides of female abdomen yellow, dorsum of first segment partly yellow; segments 2 to 4 with silvery-gray pollen confined principally to bases of segments; second and third segments with a pair of discal macrochaetae; first and second segments with a pair and third with a row of marginal macrochaetae; fourth segment with a discal row and tipped with marginal bristles.

Length 7 to 8 mm.

Type locality.—Mount Washington, N. H.

Distribution.—New Hampshire 1, Idaho 2, Wyoming 1.

Type.—Male, U.S.N.M. No. 3753.

Host.—Unknown.

Remarks.—The material examined consisted of the type male (Mrs. Slosson) and three females collected by Aldrich.

5. Genus SISYROPA Brauer and Bergenstamm

Sisyropa BRAUER and BERGENSTAMM. Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 56, p. 163, 1889; vol. 58, p. 344, 1891.—COQUILLET, Proc. U. S. Nat. Mus., vol. 37, p. 696, 1910.—TOWNSEND, Manual of myiology, pt. 4, pp. 207, 209, 211, 1936. (Genotype,¹⁵ *Tachina thermophila* Wiedemann. Monotypic example; Brauer and Bergenstamm, 1889.)

Exorista of COQUILLET (nec Meigen) partim, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 100, 1897.

Oreoxorista TOWNSEND, Proc. Ent. Soc. Washington, vol. 14, p. 165, 1912; Proc. Biol. Soc. Washington, vol. 28, p. 21, 1915; Manual of myiology, pt. 4, pp. 206, 207, 210, 211, 1936. (Genotype, *Exorista eudryae* Townsend. By original designation.) (New synonymy.)

Zenillia of ALDRICH and WEBBER (nec Robineau-Desvoidy) partim, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 7, 1924.

Brauer and Bergenstamm in their synopsis in 1889 cited *Tachina thermophila* as the monotypic example of the genus *Sisyropa*, which makes it the genotype. Brauer and Bergenstamm did not recognize the genus *Carcelia*, and their species in 1891 were divided mostly between the genera *Sisyropa* and *Parexorista*. As defined by this paper, species of *Aplomya* and *Zenillia* were also included in their genus *Sisyropa*.

Owing principally to the fact that the pertinent diagnostic characters were not selected, the status of *Sisyropa* has been a perplexing question for many years. The European authorities gradually accepted it as being synonymous with *Carcelia*. Townsend made an attempt to apply its use to the North American fauna in his *Sisyropa*

¹⁵ The writer had the privilege of examining the *Sisyropa* genotype, *thermophila* (Wiedemann), which is in the Natural History Museum, Vienna, Austria.

hemerocampae, which was placed in synonymy with *Carcelia amplexa*. In 1912 Townsend proposed his genus *Oxeorista*,¹⁶ which must now be placed in synonymy with *Sisyropa*. Townsend places both *Sisyropa* and *Oxeorista* in the tribe Carceliini.

The main diagnostic characters of the genus *Sisyropa* are as follows: Scutellum with four pairs of marginal scutellars and one strong apical pair; hind tibia strongly ciliate on the anterodorsal side, in both sexes, with regular, long, comblike, curved bristles, among which one sometimes stands out larger; third abdominal segment of male with a dense patch of hairs underneath on each side. These characters will readily separate *Sisyropa* from *Aplomya*. As the front at the vertex or narrowest part is 30 per cent or less of the head width and the predominant sexual characteristics (front narrower, and claws and pulvilli elongated in the male) are retained, *Sisyropa* can be readily separated from *Phryxe*, *Thelymyia*, and *Chrysophryxe*. As the gena is one-sixth to one-seventh the eye height, *Carcelia* is readily excluded. The shape of the abdomen, which is *Carcelia*-like, should not be confused with that of *Zenillia*. The Nearctic species of *Sisyropa* lack bristly hairs behind on the apex of the hind coxa.

Using the main characters as cited, only the following two species of those indicated as belonging in Brauer and Bergenstamm's genus in 1891 can be retained: *Sisyropa thermophila* (Wiedemann), genotype, Oriental Realm; *Sisyropa lota* (Meigen), Palearctic Realm. *S. lota* was referred to *Exorista* of authors by Baer, Stein and Lundbeck.

If the pilosity of the eyes is disregarded, the biological relationship of *Sisyropa* to the genus *Sturmia* is evident. Townsend refers *Sisyropa* to the tribe Carceliini and *Sturmia* to Sturmiini, which he considers to be close to Carceliini.

Townsend considers *Exorista lobeliae* Coquillett to be a *Sisyropa*. Neither *E. lobeliae* nor *Zenillia valens* Aldrich and Webber, which is similar to *lobeliae* in many respects, possesses the characteristics ascribed to *Sisyropa*. These two species are not treated in this revision; instead, they are referred to the *Phorocera* complex of Aldrich and Webber.

¹⁶ In 1915, convinced that the specimens T D 395 and T D 425 (upon which *Oxeorista* was founded) were distinct from *eudryae*, Townsend proposed the name *thompsoni* for them. He states that the Dayton, Ohio, female in the U. S. National Museum reared by Jewett (determined by Coquillett as *eudryae*) was designated for him by Coquillett as the holotype of *thompsoni*. As an examination of this specimen proves it to be *eudryae* Townsend, the synonymy is established. It is difficult to see how the designation by Townsend in his Manual, "The true holotype of the genotype is labelled T D 395 and the paratype T D 425" can be accepted. It is unfortunate that the specimen T D 395 was not originally designated as the holotype. The specimen T D 395 was found in the United States National Museum as a paratype of *Zenillia formosa* Aldrich and Webber and is now referred to *Carcelia*.

KEY TO THE SPECIES OF SISYROPA

1. Except for the reclinate prevertical bristle, the male usually with 1 and female usually with 2 reclinate upper frontal bristles, 7 to 9 frontal bristles; frontal orbit, face and cheek, and posterior orbit light-silvery-gray pollinose, parafrontal with a slight brassy tinge; antenna black, third segment about three times as long as the second, slightly rufous at junction of second and third segments, second segment slightly rufescent in female; palpus yellow; median dorsal vitta of abdomen shining black, uninterrupted on the second and third segments; midtibia bearing 3 median bristles on anterolateral side, upper bristle nearly as strong as middle, lower bristle much smaller; size 6 to 8 mm.; a lighter appearing species----- 1. *eudryae* (Townsend) (p. 99)

Except for the reclinate prevertical bristle, the male and female with no reclinate upper frontal bristles, male with 10 or 11 and female with 7 to 9 frontal bristles; frontal orbit blackish-gray pollinose, the black gradually becoming more predominant toward vertex, cheek dark-gray pollinose, face and posterior orbit silvery pollinose with a smoky tinge; antenna black, third segment about $2\frac{1}{2}$ times as long as second; palpus yellow, slightly infuscated at base; median dorsal vitta of abdomen shining black on second segment, becoming indistinct on basal half of third segment; mid tibia bearing three or more strong median bristles on anterolateral side, and when with three, upper bristle nearly as strong as middle, lower bristle usually not much smaller than upper; when with more than 3 bristles, especially in some of the larger females, additional bristles usually situated between normal 3 as described above; size 8 to 11 mm.; bristly appearance of this species accentuated by head, thorax, and abdomen appearing more densely covered with longer, finer hairs; a blacker appearing species----- 2. *alypiae*, new species (p. 101)

1. SISYROPA EUDRYAE (Townsend)

Errorista eudryae TOWNSEND, Trans. Amer. Ent. Soc., vol. 19, p. 287, 1892; Psyche, vol. 7, pp. 329-331, 1896.—COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 100, 1897.—SMITH, Catalogue of New Jersey insects, p. 780, 1909.—TOTHILL, Can. Ent., vol. 45, p. 70, 1913; Ottawa Nat., vol. 28, No. 9, p. 114, 1914.—GREENE, Proc. U. S. Nat. Mus., vol. 60, art. 10, p. 17, fig. 27 (puparium), 1922.

Oëxorista eudryae (Townsend) TOWNSEND, Proc. Ent. Soc. Washington, vol. 14, p. 165, 1912.

Exorista eudryae of THOMPSON (nec Townsend) TOWNSEND, Ann. Ent. Soc. Amer., vol. 8, p. 89, 1915.

Oëxorista thompsoni TOWNSEND (partim), Proc. Biol. Soc. Washington, vol. 28, p. 21, 1915.

Zenillia eudryae (Townsend) ALDRICH and WEBBER, Proc. U. S. Natl. Mus., vol. 63, art. 17, pp. 21-22, 1924.—JOHNSON, List of New England Diptera, p. 196, 1925; Biological survey of Mount Desert region, The insect fauna, pt. 1, p. 201, 1927.—WEST, Cornell Univ. Agr. Exp. Stat. Mem. 101, p. 814, 1928.—ALDRICH, Proc. U. S. Natl. Mus., vol. 80, art. 20, p. 3, 1932.—SCHAFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 112, 1934.

Sisyropa eudryae (Townsend), TOWNSEND, Manual of myiology, pt. 4, pp. 207, 209, 1936.

Aldrich and Webber have discussed the synonymy of *eudryae* and *thompsoni*. I have further compared *thompsoni* with *eudryae*. The

type specimen *thompsoni* (female) is a poor one. It has two reclinate upper frontal bristles besides the prevertical one; the second segment of the antenna is rufescent; the midtibial bristles are not typical of either form but nearer *eudryae*; it has three of these, with one between the lower and middle bristles; apparently it has an interrupted dorsal vitta on the abdomen. As *eudryae* females quite often have two reclinate upper frontals besides the prevertical bristle (maximum discrepancy from *alypiae* females) and the second joint of the antenna is rufescent, the above synonymy is confirmed.

Head with front of male at the narrowest 0.24, 0.25, and 0.26 (in three specimens) and front of female about 0.30 of the head width, frontalia about one-third width of front, brown; frontal bristles exclusive of reclinate frontals seven to nine in number (often six in the female), extending down to base of third antennal joint; female with two proclinate fronto-orbital bristles; facial ridge bristly on lowest third, gena about one-seventh eye height; arista brownish black, thickened basally, penultimate joint short; palpus yellow, somewhat thickened and curved at tip.

Thorax black with a bluish tinge and lightly covered with grayish pollen; five narrow black mesonotal vittae; four postsutural dorso-central macrochaetae; scutellum bluish gray pollinose, yellow at tip, four pairs of marginal scutellars (one of the marginal pairs usually weaker) and one decussate apical pair, one pair of discal scutellars; three sternopleural macrochaetae; front tibia with two bristles on median posterolateral side; hind tibia ciliate comblike, usually with one longer bristle; wing grayish hyaline, third vein with two bristles at base; squamae silvery white.

Abdomen shining black, second to fourth segments light-gray pollinose with more or less of a bluish tinge except posterior borders and a median dorsal vitta, which are shining black; males usually with second and third segments faintly reddish on sides; first and second segments each with one pair of marginal macrochaetae, the third a marginal row, and the fourth irregularly tipped with marginal and submarginal bristles; third abdominal segment of male with a dense patch of hairs underneath on each side.

Length 6 to 8 mm.

Type locality.—Ithaca, N. Y.

Distribution.—New Hampshire 1, Vermont 1, Massachusetts 4, New York 2, Pennsylvania 1, New Jersey 1, Maryland 1, Virginia 1, North Carolina 1, Ohio 1, Ontario. Additional published and unpublished records not duplicated above: Maine (Johnson), Connecticut (Ely, Aldrich and Webber), New York (West), Kansas (Snow), Quebec (Winn and Beaulieu), Ontario (Gibson). Coquillett records New

Hampshire, Massachusetts 2, New Jersey, Maryland, District of Columbia, Virginia, and Missouri.

Type.—University of Kansas.

Hosts.—*Euthisanotia (Eudryas) grata* (Fabricius) 17, *Euthisanotia unio* Hübner 1, *Euthisanotia* sp. 3. Published and unpublished records not duplicated in above material: *Euthisanotia grata* (Brimley, Ely, and Tothill), *Euthisanotia unio* (Brimley); *Automeris io* (Fabricius) (Porter). Coquillett records *Acronycta* sp. (Koebele, Lugger, and Riley), *Acronycta luteicoma* Grote and Robinson (Riley), *Heterocampa marthesia* (Cramer) (Lugger), *Vanessa atalanta* (Linnaeus) (Sprague). The author feels that all but the first three host records should be viewed with some suspicion.

Remarks.—The foregoing description is based on 1 female "from the type lot of *eudryae*," Cornell University, reared from *Eudryas* (Comstock); 1 female, type specimen of Townsend's *thompsoni* (type, U.S.N.M. No. 19136), from *E. unio*, Dayton, Ohio (Jewett); 12 reared specimens bearing Gypsy Moth Laboratory note numbers, all reared from *E. grata* (1 male No. 12176 F1, from Castleton, Vt., having one fronto-orbital bristle on one side, agrees perfectly with Townsend's type description); 1 male from *E. grata* (Saunders); 1 male ex *E. grata*, Raleigh, N. C.; 1 male and 1 female from *Eudryas* (Dimmock); 1 male and 1 female from *E. grata* (Dimmock); 2 males from *E. grata* (Isely); 1 reared female (Riley); 4 males and 11 females collected by Brodie, Knab, and Shannon.

Brimley's record of rearing this species from *Estigmene acraea* most likely refers to a female of *Carcelia reclinata*, August 10, 1917, Raleigh, N. C. (Brimley).

Adults, April to August; number per host, one to eight; generations, one; hibernation, in puparium.

2. SISYROPA ALYPIAE, new species

Exorista eudryae Townsend, COQUILLET (partim), U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 14, 1897.

Zenillia eudryae (Townsend) ALBRICH and WEBER (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 21-22, 1924.—ESSIG (partim), Insects of western North America, p 581 (locality citation refers to *alypiae*), 1926.

Zenillia n. sp. (1) SCHAFFNER and GRISWOLD, U. S. Dept. Agr. Misc. Publ. 188, p. 113, 1934.

Although somewhat larger, this species is very similar to *Sisyropa eudryae*. The differences have all been cited in the table to the species. Otherwise, the description is practically the same.

Male (type).—Head with front at narrowest about one-fourth width of head; frontal row of bristles, not including reclinate prevertical bristle, 10 in number on one side and 11 on other, extending down to base of third antennal joint; gena one-sixth eye height; face

and posterior orbit dark-smoky-silver pollinose; third antennal segment a little less than three times as long as second; arista tapering, slightly thickened on basal half, penultimate segment short; palpus yellow, infuscated at base, thickened and curved at tip, thickly beset with short black hairs which are longer toward base.

Thorax black, with a bluish tinge and covered with gray pollen; midtibia bearing 3 long bristles on anterolateral side, upper bristle nearly as strong as middle, lower not much smaller than upper, 1 smaller bristle about one-half size of upper bristle situated between it and middle bristle; hind tibia ciliate.

Abdomen with second segment having a faintly reddish spot on sides; third abdominal segment with a dense patch of hairs underneath on each side.

Length 10 mm.

Female (allotype).—Head with front at narrowest slightly less than one-third width of head; frontal bristles eight in number besides reclinate prevertical bristle; two pairs of proclinate fronto-orbital bristles; outer vertical present. Additional bristles on midtibia situated between normal three; pulvilli less than one-half length of those of male. Third abdominal segment lacking dense patch of hairs underneath on each side; sides of abdomen black. Otherwise description same as for male.

Length 9 mm.

The paratype material varies as follows from the descriptions: The frontal bristles in the male vary from 10 to 11 and in female from 7 to 9; the front in the male is 0.26 and 0.27 (in two specimens), the front in the female is 0.30 (in two specimens). The middle tibia usually has only three bristles on the anterolateral side, but some of larger specimens, especially females, have additional ones. In the male the reddish spot on the sides of the abdomen usually covers portions of the second and third segments.

Length 8 to 11 mm.

Puparium.—Large, subshining, dark rufescent brown. Spiracles shining black, slightly raised above the surface, separation space about equal to width of one plate. Above, between and below the spiracles, a prominent, ridgelike elevation much higher than stigmal plates, the elevation above crescent shaped and descending slightly on outer sides of stigmal plates. Each plate has three serpentine, yellowish spiracular entrances. Button large, round, well defined, centrally located on plate, spiracular entrances coming around on inner side. Anal opening comparatively small, far below the spiracles. Spiracles located about on longitudinal axis.

Length 8.5 mm., diameter 4 mm.

The larger puparium of *Sisyroga alypiæ* can be easily distinguished from the smaller *S. eudryæ*. The crescent-shaped elevation above the spiracles is not present in *S. eudryæ*. The stigmal plates are not so highly raised in *alypiæ*; the spiracular entrances are longer and more convoluted; the button is centrally located, whereas in *eudryæ* the button is located more on the inner side of the plate. The spiracles are located about on the longitudinal axis in *alypiæ*, whereas in *eudryæ* they are located on the upper side of the axis. The spiracles in *alypiæ* are separated by about the width of one stigmal plate; in *eudryæ* the separation width is about twice the width of one stigmal plate. The anal opening of *alypiæ* is smaller than that of *eudryæ*.

Type and allotype locality.—Somerville, Mass.

Distribution.—Vermont 1, Massachusetts 12, Montana 1, British Columbia 1. Published record: Missouri (Coquillett).

Type.—Male, U.S.N.M. No. 54149.

Hosts.—*Alypia octomaculata* (Fabricius) 35; *Psychomorpha epimensis* (Drury) (no host adults were recovered from this collection) 1. All previous published records referring to the recovery of *eudryæ* from *A. octomaculata* can probably be considered to be *alypiæ*.

Remarks.—The material examined consisted of 36 reared specimens bearing Gypsy Moth Laboratory note numbers (including the type and allotype No. 10017 M2; two male and two female paratypes, Lexington, Mass., No. 10017; one male and one female paratype, Boston, Mass., No. 10017 G2; one female paratype, Lynn, Mass., No. 10017 G3; one male paratype, Everett, Mass., No. 10017 L2a; one male and one female paratype, Revere, Mass., No. 10017 L3 and L3a; two male paratypes, Somerville, Mass., No. 10017 M2, M5; two female paratypes, Somerville, Mass., No. 10017 P1); one male, Kaslo, British Columbia, labeled "compared with type of *E. eudryæ* Towns. by Lawson" (Currie). (This specimen was discussed by Aldrich and Webber under *Zenillia eudryæ*; it is *alypiæ*); one male, Summit Station, Mont. (Aldrich). One female from Revere, Mass., Gypsy Moth Laboratory No. 10017 L3, has bare eyes (front 0.31).

Adults, May to July; number per host, one to three; generations, one; hibernation, in puparium.

6. Genus THELYMYIA Brauer and Bergenstamm

Thelymyia BRAUER and BERGENSTAMM, Denkschr. Akad. Wiss. Wien, math.-nat. Kl., vol. 58, p. 331, 1891.—TOWNSEND, Manual of myiology, pt. 4, p. 224, 1936. [Genotype, *T. lowei* Brauer and Bergenstamm. Monotypic. (*T. lowei*)=*Tachina saltuum* Meigen, 1824, Systematische Beschreibung der europäischen zweiflügeligen Insecten, vol. 4, pp. 155, 329, 1824.]

Exorista of COQUILLET (nec Meigen) partim, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 94, 1897.

Zenillia of ALDRICH and WEBBER (nec Robineau-Desvoidy), partim, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 33, 1924.

This genus containing two Nearctic species is closely related to *Phryxæ* (s. s.). The European authorities have difficulty in separating *Thelymyia* from *Exorista* of authors. A combination of characters, such as apical scutellars turned backward, palpi yellow, three post-sutural dorsocentral macrochaetae, and male with two proclinate fronto-orbital bristles, serves to separate *Thelymyia* from *Phryxæ*. Townsend recognizes the close relationship of *Phryxæ* and *Thelymyia* by placing them both in the tribe Lydellini.

KEY TO THE SPECIES OF THELYMYIA

1. Frontal orbit silvery gray, not noticeably black toward vertex; facial ridge bristly on lowest one-fourth or one-third; palpus yellow; thorax and scutellum gray-pollinose, with four black mesonotal vittae, scutellum black with extreme tip usually faintly yellow; sternopleural macrochaetae three; midtibia with two median anterolateral bristles; gray pollen of the abdomen fairly heavy and well defined; apical one-fourth to one-third of segments 2 and 3 and apical half of segment 4 sharply demarked and shining black; narrow dorsal abdominal vitta black and well defined; dorsal abdominal hairs in male depressed; bristles on fourth segment approaching macrochaetae in size in male only----- 1. *curriei* (Coquillett) (p. 104)
- Frontal orbit silvery gray but more blackish, becoming black toward vertex; gena dark blackish gray, subshining; facial ridge usually bristly half way; palpus yellow, slightly infuscated at base; thorax and scutellum covered with such a thin layer of pollen as to appear shining black; mesonotal stripes hardly distinguishable; sternopleural macrochaetae three or more (very variable); scutellum black; midtibia with three or four median anterolateral bristles; gray pollen of abdomen so thin and ill-defined as to appear shining black, pollen slightly more noticeable at base and sides of segments; dorsal abdominal vitta hardly distinguishable; fourth segment of female polished black; dorsal abdominal hairs in male erect; macrochaetae on fourth segment, those of male the same size as on third segment, those of female almost same size as third.
2. *erecta*, new species (p. 105)

1. **THELYMYIA CURRIEI** (Coquillett), new combination

Exorista curriei COQUILLET, U. S. Dept. Agr., Div. Ent., Tech. Bull. 7, p. 94, 1897.

Zenillia curriei (Coquillett) ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 33-34, 1924.

This species closely resembles the genotype, *saltuum* (Meigen). Head with front of male at narrowest 0.35 to 0.39 and front of female 0.35 to 0.38 of head width; frontalia one-third width of front; frontal row of five to eight bristles plus two reclinate upper frontals, extending down to base of third antennal segment, two proclinate fronto-orbital bristles; male with small and female with outer vertical bristle; gena about one-seventh eye height; antenna black, length of third segment in male four to four and one-half and

in female three to three and one-half times as long as second segment; arista thickened on basal fourth, penultimate segment short.

Thorax gray-pollinose; three postsutural dorsocentral macrochaetae; three pairs of marginal and one shorter cruciate pair of apical scutellars, one pair of discal scutellars; three sternopleural macrochaetae; midtibia bearing two bristles on median anterolateral side and one inner ventral bristle; hind tibia with irregularly placed bristles of uneven length on anterolateral side; third vein with two or three bristles at base.

Abdomen black covered with gray pollen; entire first segment shining black; dorsal abdominal hairs depressed; first segment with a pair of marginal macrochaetae, second segment with a pair of discal and a pair of marginal macrochaetae, third segment with usually four discal macrochaetae in a line and a marginal row, fourth segment irregularly tipped with marginal and submarginal bristles approaching the size of macrochaetae in male only.

Length of type 8 mm.

Type locality.—University, Grand Forks, N. Dak.

Type.—Male, U.S.N.M. No. 3752 (Coquillett listed it as a female).

Distribution.—Wisconsin 3, North Dakota 2, South Dakota 1, Texas 1.

Host.—Unknown. The genotype, *Thelymyia saltuum*, has been recovered from *Catocala sponsa* (Linnaeus).

Remarks.—The description is based on the type male and on three males and three females collected by Aldrich, Baker, and Bishopp. Rolla P. Currie collected the type specimen. The times of collections ranged from April 19 in Texas to July 17 in Wisconsin.

2. THELYMYIA ERECTA, new species

Zenillia curriei (Coquillett) ALDRICH and WEBBER (partim), Proc. U. S. Nat. Mus., vol. 63, art. 17, pp. 33-34, 1924.

This species is very similar to *Thelymyia curriei*. The differences have all been cited in the key to the species (p. 104). Otherwise the species are practically the same.

Male (type).—Head with front at narrowest 0.37 head width; facial ridge bristly on one-half to two-fifths; gena one-sixth eye height, dark gray black, subshining; antenna black, third segment four times as long as second; arista thickened on basal one-third.

Thorax covered with such a thin layer of pollen as to appear shining black; sternopleural macrochaetae four on one side, five on the other; midtibia with four median anterolateral bristles on one side and two with one smaller on the other side.

Abdomen covered with such a thin layer of pollen as to appear

shining black, pollen arranged as in *curriei*, more noticeable at base and sides of segments; dorsal abdominal hairs erect; third segment with four discal macrochaetae in a row.

Female (allotype).—Front at narrowest 0.35 head width; length of third segment of antenna three and one-fourth times that of second; facial ridge bristly on lowest one-third; sternopleurals three plus an additional weak one on one side; mid tibia with three median anterolateral bristles. Dorsal abdominal hairs depressed; four discal macrochaetae on third segment not in a row; fourth segment polished black; otherwise description same as for male.

Paratypes (one male and one female).—This material varies as follows from the type and allotype notations: Front at narrowest in male 0.39, in female 0.37 head width; facial ridge of male bristly one-half, of female two-fifths; arista of male thickened on basal fourth. Sternopleurals three; midtibia of male with three and of female with four median bristles on anterolateral side, female with two inner ventral bristles; female with four discal macrochaetae on third segment in a row; abdomen of male noted as having exceptionally thin pollen.

Type and allotype locality.—Juliaetta, Idaho.

Type.—Male, U.S.N.M. No. 54141.

Host.—Unknown.

Remarks.—Three males and three females collected by Aldrich, including the type and allotype, Juliaetta, Idaho; including also one male and one female paratype, Lawyers Canyon, Idaho, on July 16, 1909; one male, Moscow, Idaho, July 8, 1916; and one female, Sweetwater, Idaho, June 17, 1930.

7. CHRYSOPHRYXE, new genus

The genus *Chrysophryxe* should be associated with the genera *Thelymyia* and *Phryxe*. The genus has many of the characteristics of *Phryxe*, namely, apical scutellars erect or proclinate, decussate; four postsutural dorsocentral macrochaetae; male without frontal-orbital bristles. *Chrysophryxe*, however, is predominantly golden pollinose with yellow palpi and a pair of true discal macrochaetae on the second and third abdominal segments.

1. CHRYSOPHRYXE TIBIALIS, new species, genotype

Chrysoexorista viridis TOWNSEND (partim), Proc. U. S. Nat. Mus., vol. 49, p. 435, 1915.

Male (type).—Head with front at narrowest 0.36 head width; frontal row of six bristles, extending from on a level with below arista to two reclinate preverticals; vertical and weak outer vertical bristle; facial ridge bristly on lowest one-fifth; gena one-fifth eye

height; frontal orbit and face golden-pollinose, lower side of face and gena more silvery; antenna black; arista thickened on basal two-fifths, penultimate segment longer than broad; palpus yellow, base infuscated.

Thorax black, sides silvery gray pollinose, dorsum golden pollinose; four black mesonotal vittae; four postsutural dorsocentral macrochaetae; scutellum with three pairs of marginal scutellars and one weak decussate apical pair turned upward, one pair of discal scutellars; three sternopleural macrochaetae; midtibia with one strong median anterolateral bristle, one strong inner ventral bristle; hind tibia ciliate, with one longer bristle; pulvilli short; wing with three bristles at base of third vein.

Abdomen black, venter of segments one, two, and three silvery gray pollinose; basal two-thirds of segments 2, 3, and 4 golden pollinose tinged with green, no dorsal vitta; dorsum of first segment shining black, apical margins of other segments shining brownish black; first and second segments with a pair and third segment with a row of marginal macrochaetae; second and third segments with a pair of discal macrochaetae; fourth segment irregularly tipped with bristles.

Length 9 mm.

Type locality.—Brazil.

Type.—Male, U.S.N.M. No. 54140.

Host.—Unknown.

Remarks.—Described from the type specimen, which was previously *Chrysoexorista viridis* Townsend, male allotype U.S.N.M. No. 19611.

The genitalia are similar to those of *Zenillia angustifrons* which Townsend designated as subspecies of *Chrysoexorista viridis*. *Z. angustifrons* possesses more *Zenillia*-like characteristics than the male described above.

8. ANGUSTIA, new genus

The genus *Angustia* should be associated with the genus *Apomya*. *Angustia*, however, has only two sternopleural bristles, the frontal bristles descend to the middle of the second antennal segment, and the fourth segment of the abdomen is destitute of macrochaetae. The thorax and abdomen are wholly golden pollinose.

1. ANGUSTIA ANGUSTIVITTA (Aldrich and Webber) (genotype)

Zenillia angustivitta ALDRICH and WEBBER, Proc. U. S. Nat. Mus., vol. 63, art. 17, p. 18, 1924.

Head with front at narrowest 0.28 head width; frontal row of four bristles, extending from middle of second antennal segment to two

reclinate preverticals; facial ridge bristly on lowest one-fourth; gena one-fourth eye height and covered with fine white hairs; frontal orbit golden, face silver-white pollinose; antenna with first two segments and basal part of third yellow, third segment two and one-fourth times second; arista thickened on basal one-fourth, penultimate segment short; palpus pale yellow.

Thorax golden-pollinose, marked with four mesonotal vittae; three postsutural dorsocentral macrochaetae; scutellum golden pollinose, with three pairs of marginal scutellars and one decussate apical pair turned backward; two sternopleural macrochaetae; legs with coxae and femora yellow, tibiae brown, and tarsi black; midtibia with one median anterolateral bristle and inner ventral bristle; hind tibia roughly ciliate; no bristly hairs behind on apex of hind coxa; third vein with three to five bristles at base.

Abdomen reddish yellow, golden pollinose; first and second segments with a pair of discal macrochaetae; first and second segments with a pair and third with a row of marginal macrochaetae; fourth segment covered with a few scattered small bristles; abdominal hairs depressed.

Length 8 mm.

Type locality.—Fort Wadsworth, Staten Island, N. Y.

Distribution.—New York 1, Pennsylvania 1.

Type.—Female, U.S.N.M. No. 25701.

Host.—Unknown.

Remarks.—The material examined consisted of the type specimen, July 16, 1917, and one female, Swarthmore, Pa., June 18, 1906.